GE Medical Systems

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Technical Publications

Direction 2296978–100

Revision 8

Revolution™ XR/d™ Full Digital System Pre-Installation and Specifications

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WARNING

- THIS SERVICE MANUAL IS AVAILABLE IN ENGLISH ONLY.
- IF A CUSTOMER'S SERVICE PROVIDER REQUIRES A LANGUAGE OTHER THAN ENGLISH, IT IS THE CUSTOMER'S RESPONSIBILITY TO PROVIDE TRANSLATION SERVICES.
- DO NOT ATTEMPT TO SERVICE THE EQUIPMENT UNLESS THIS SERVICE MANUAL HAS BEEN CONSULTED AND IS UNDERSTOOD.
- FAILURE TO HEED THIS WARNING MAY RESULT IN INJURY TO THE SERVICE PROVIDER, OPERATOR OR PATIENT FROM ELECTRIC SHOCK, MECHANICAL OR OTHER HAZARDS.

AVERTISSEMENT

- CE MANUEL DE MAINTENANCE N'EST DISPONIBLE QU'EN ANGLAIS.
- SI LE TECHNICIEN DU CLIENT A BESOIN DE CE MANUEL DANS UNE AUTRE LANGUE QUE L'ANGLAIS, C'EST AU CLIENT QU'IL INCOMBE DE LE FAIRE TRADUIRE.
- NE PAS TENTER D'INTERVENTION SUR LES ÉQUIPEMENTS TANT QUE LE MANUEL SERVICE N'A PAS ÉTÉ CONSULTÉ ET COMPRIS.
- LE NON-RESPECT DE CET AVERTISSEMENT PEUT ENTRAÎNER CHEZ LE TECHNICIEN, L'OPÉRATEUR OU LE PATIENT DES BLESSURES DUES À DES DANGERS ÉLECTRIQUES, MÉCANIQUES OU AUTRES.

WARNUNG

- DIESES KUNDENDIENST–HANDBUCH EXISTIERT NUR IN ENGLISCHER SPRACHE.
- FALLS EIN FREMDER KUNDENDIENST EINE ANDERE SPRACHE BENÖTIGT, IST ES AUFGABE DES KUNDEN FÜR EINE ENTSPRECHENDE ÜBERSETZUNG ZU SORGEN.
- VERSUCHEN SIE NICHT, DAS GERÄT ZU REPARIEREN, BEVOR DIESES KUNDENDIENST–HANDBUCH ZU RATE GEZOGEN UND VERSTANDEN WURDE.
- WIRD DIESE WARNUNG NICHT BEACHTET, SO KANN ES ZU VERLETZUNGEN DES KUNDENDIENSTTECHNIKERS, DES BEDIENERS ODER DES PATIENTEN DURCH ELEKTRISCHE SCHLÄGE, MECHANISCHE ODER SONSTIGE GEFAHREN KOMMEN.

AVISO

- ESTE MANUAL DE SERVICIO SÓLO EXISTE EN INGLÉS.
- SI ALGÚN PROVEEDOR DE SERVICIOS AJENO A GEMS SOLICITA UN IDIOMA QUE NO SEA EL INGLÉS, ES RESPONSABILIDAD DEL CLIENTE OFRECER UN SERVICIO DE TRADUCCIÓN.
- NO SE DEBERÁ DAR SERVICIO TÉCNICO AL EQUIPO, SIN HABER CONSULTADO Y COMPRENDIDO ESTE MANUAL DE SERVICIO.
- LA NO OBSERVANCIA DEL PRESENTE AVISO PUEDE DAR LUGAR A QUE EL PROVEEDOR DE SERVICIOS, EL OPERADOR O EL PACIENTE SUFRAN LESIONES PROVOCADAS POR CAUSAS ELÉCTRICAS, MECÁNICAS O DE OTRA NATURALEZA.

ATENÇÃO

- **ESTE MANUAL DE ASSISTÊNCIA TÉCNICA SÓ SE ENCONTRA DISPONÍVEL EM INGLÊS.**
- **SE QUALQUER OUTRO SERVIÇO DE ASSISTÊNCIA TÉCNICA, QUE NÃO A GEMS, SOLICITAR ESTES MANUAIS NOUTRO IDIOMA, É DA RESPONSABILIDADE DO CLIENTE FORNECER OS SERVIÇOS DE TRADUÇÃO.**
- **NÃO TENTE REPARAR O EQUIPAMENTO SEM TER CONSULTADO E COMPREENDIDO ESTE MANUAL DE ASSISTÊNCIA TÉCNICA.**
- **O NÃO CUMPRIMENTO DESTE AVISO PODE POR EM PERIGO A SEGURANÇA DO TÉCNICO, OPERADOR OU PACIENTE DEVIDO A‘ CHOQUES ELÉTRICOS, MECÂNICOS OU OUTROS.**

AVVERTENZA

- **IL PRESENTE MANUALE DI MANUTENZIONE È DISPONIBILE SOLTANTO IN INGLESE.**
- **SE UN ADDETTO ALLA MANUTENZIONE ESTERNO ALLA GEMS RICHIEDE IL MANUALE IN UNA LINGUA DIVERSA, IL CLIENTE È TENUTO A PROVVEDERE DIRETTAMENTE ALLA TRADUZIONE.**
- **SI PROCEDA ALLA MANUTENZIONE DELL’APPARECCHIATURA SOLO DOPO AVER CONSULTATO IL PRESENTE MANUALE ED AVERNE COMPRESO IL CONTENUTO.**
- **NON TENERE CONTO DELLA PRESENTE AVVERTENZA POTREBBE FAR COMPIERE OPERAZIONI DA CUI DERIVINO LESIONI ALL’ADDETTO ALLA MANUTENZIONE, ALL’UTILIZZATORE ED AL PAZIENTE PER FOLGORAZIONE ELETTRICA, PER URTI MECCANICI OD ALTRI RISCHI.**

警告

・このサービスマニュアルには英語版しかありません。
・ＧＥＭＳ以外でサービスを担当される業者が英語以外の言語を要求される場合、翻訳作業はその業者の責任で行うものとさせていただきます。
・このサービスマニュアルを熟読し理解せずに、装置のサービスを行わないで下さい。
・この警告に従わない場合、サービスを担当される方、操作員あるいは患者さんが、感電や機械的又はその他の危険により負傷する可能性があります。

注意:

- 本维修手册仅存有英文本。
- 非 GEMS 公司的维修员要求非英文本的维修手册时，客户需自行负责翻译。
- 未详细阅读和完全了解本手册之前，不得进行维修。
- 忽略本注意事项会对维修员，操作员或病人造成触电，机械伤害或其他伤害。

IMPORTANT! . . . X-RAY PROTECTION

X-ray equipment if not properly used may cause injury. Accordingly, the instructions herein contained should be thoroughly read and understood by everyone who will use the equipment before you attempt to place this equipment in operation. The General Electric Company, Medical Systems Group, will be glad to assist and cooperate in placing this equipment in use.

Although this apparatus incorporates a high degree of protection against x-radiation other than the useful beam, no practical design of equipment can provide complete protection. Nor can any practical design compel the operator to take adequate precautions to prevent the possibility of any persons carelessly exposing themselves or others to radiation.

It is important that everyone having anything to do with x-radiation be properly trained and fully acquainted with the recommendations of the National Council on Radiation Protection and Measurements as published in NCRP Reports available from NCRP Publications, 7910 Woodmont Avenue, Room 1016, Bethesda, Maryland 20814, and of the International Commission on Radiation Protection, and take adequate steps to protect against injury.

The equipment is sold with the understanding that the General Electric Company, Medical Systems Group, its agents, and representatives have no responsibility for injury or damage which may result from improper use of the equipment.

Various protective material and devices are available. It is urged that such materials or devices be used.

CAUTION: United States Federal law restricts this device to use by or on the order of a physician.

CERTIFIED ELECTRICAL CONTRACTOR STATEMENT

All electrical installations that are preliminary to positioning of the equipment at the site prepared for the equipment shall be performed by licensed electrical contractors. In addition, electrical feeds into the Power Distribution Unit shall be performed by licensed electrical contractors. Other connections between pieces of electrical equipment, calibrations, and testing shall be performed by qualified GE Medical personnel. The products involved (and the accompanying electrical installations) are highly sophisticated, and special engineering competence is required. In performing all electrical work on these products, GE will use its own specially trained field engineers. All of GE's electrical work on these products will comply with the requirements of the applicable electrical codes.

The purchaser of GE equipment shall only utilize qualified personnel (i.e., GE's field engineers, personnel of third-party service companies with equivalent training, or licensed electricians) to perform electrical servicing on the equipment.

DAMAGE IN TRANSPORTATION

<u>All packages should be closely examined at time of delivery.</u> If damage is apparent, have notation "**damage in shipment**" written on **all** copies of the freight or express bill **<u>before</u>** delivery is accepted or "signed for" by a General Electric representative or a hospital receiving agent. Whether noted or concealed, damage **MUST** be reported to the carrier **immediately** upon discovery, or in any event, within **14** days after receipt, and the contents and containers held for inspection by the carrier. A transportation company will not pay a claim for damage if an inspection is not requested within this **14** day period.

Call Traffic and Transportation, Milwaukee, WI (414) 827–3468 / 8*285–3468 **immediately** after damage is found. At this time be ready to supply name of carrier, delivery date, consignee name, freight or express bill number, item damaged and extent of damage.

Complete instructions regarding claim procedure are found in Section "S" of the Policy & Procedure Bulletins.

6/17/94

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REVISION HISTORY

REV	DATE	REASON FOR CHANGE
0	Nov. 13, 2001	Initial release.
1	Mar. 8, 2002	Added Grid Holder data.
2	Apr. 3, 2003	Added ADS, OTS data for Gipeto release.
3	July 30, 2003	Updated with extended arm wallstand features.
4	Aug. 13, 2003	Legibility of OTS views improved.
5	Jan. 29, 2004	Changed minimum ceiling height from 2500 mm to 2745 mm.
6	Feb. 12, 2004	Fixed bad extended wallstand image on page 2. Updated mA accuracy specification.
7	May 6, 2004	Updated heat/weight specs (Cotello computer option). Updated 'weight/occupied area' specifications for standard and extended wallstands [PQR 13017039]. Added size/weight specs for Quantum stretcher (option).
8	18JUN2009	Updated Table 3–1 and Illustration 3–5 to change table height limits to 575 (minimum) to 820 (maximum).

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SECTION 1
INTRODUCTION

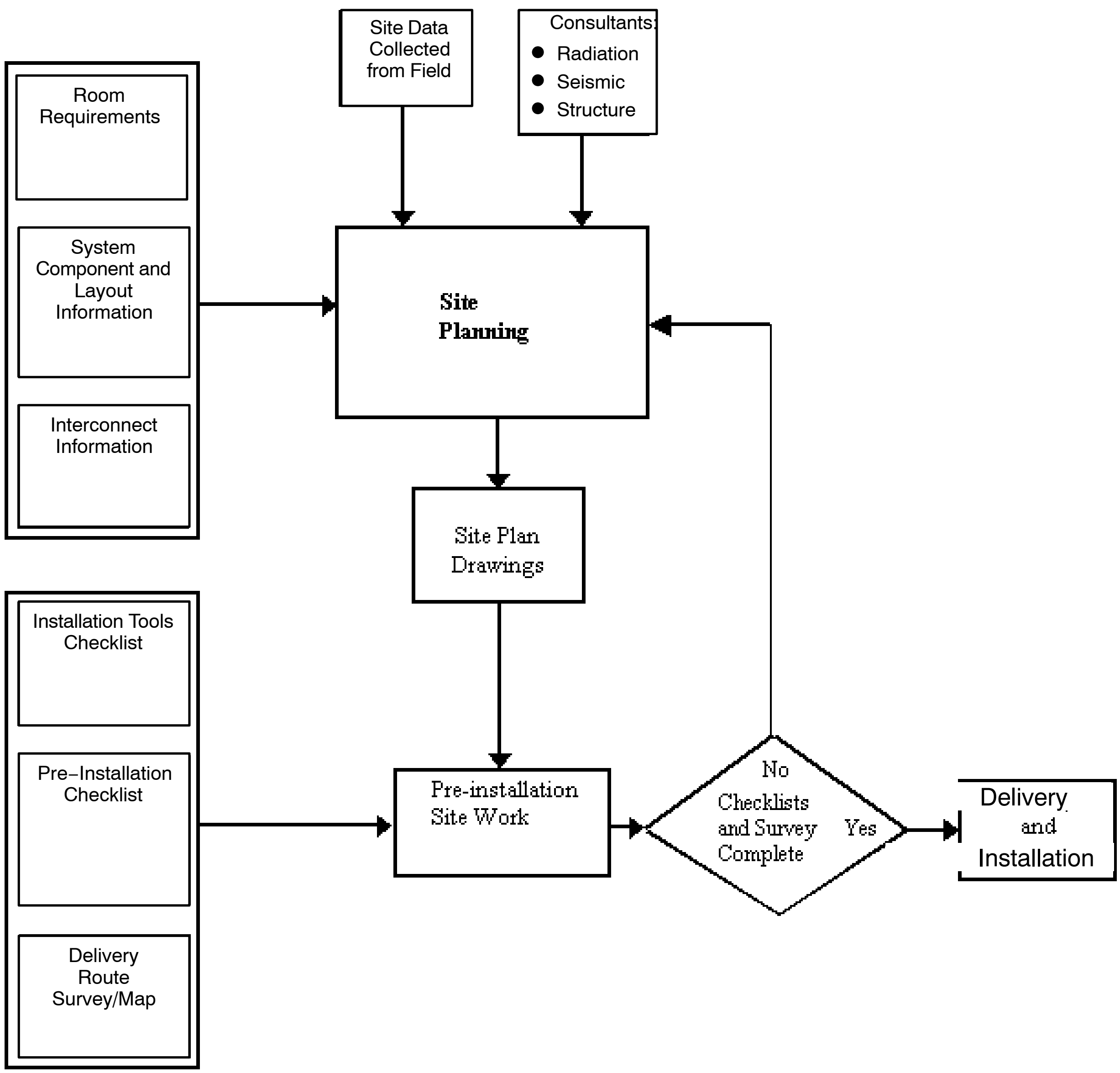
1-1 Objective and Scope of this Manual

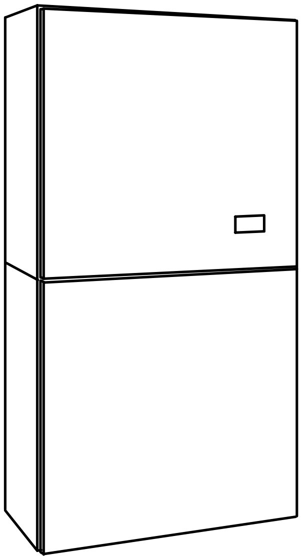
This document is intended as a guide and information resource for planning and properly preparing a site for the installation of a Revolution XR/d system.

1-2 Pre–installation Process

Complete the checklists in Chapters of this manual. They are an important part of the pre–installation process. The checklists summarize required preparations and verify the completion of the pre–installation procedures.

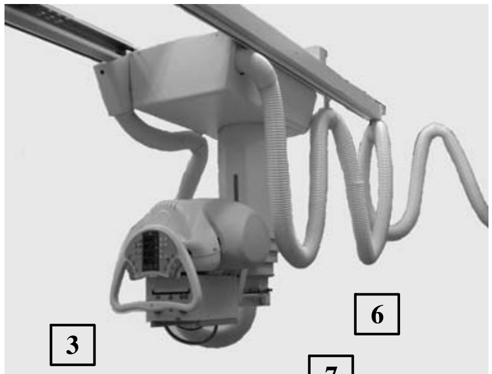
The following is a graphic outline of information flow in the pre–installation process.





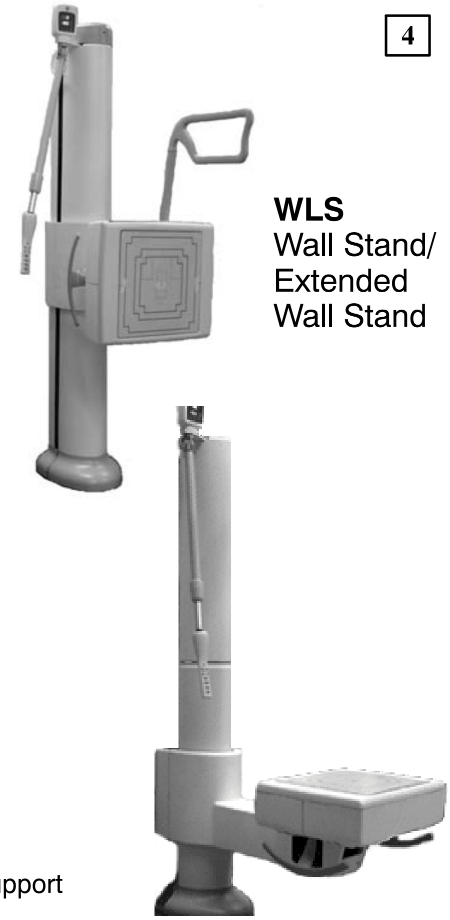
5

SKL
System Cabinet



3 6 7

OTS
OTS Suspension



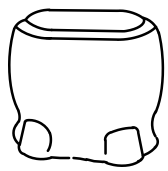
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WLS
Wall Stand/
Extended
Wall Stand



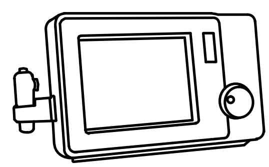
2

TBL
Revolution XR/d Table



9

DSA
Detector Support
Assembly



1

SCC1
Advantx Console

8

ADS
Acquisition Digital Station



ADS A8
Workstation
monitor



ADS Enclosure:
ADS A1 SUN tower
ADS A2 UPS
ADS A4 Modem

The Revolution XR/d is divided into basic components:

1. Advantx Console
2. Elevating Table
3. OTS Radiographic Suspension
4. Wall Stand/Extended Wall Stand
5. Systems Cabinet
6. X–ray Tube
7. Collimator
8. Acquisition Workstation
9. Detector Support Assembly

1-3 Description of System

The Revolution XR/d system may consist of the following main components:

- Elevating table with Digital Detector, Conditioner and Power Supply
- Overhead Tube Support (OTS)
- Digital detector wall stand with tilting receptor, AEC and removable grid.
- Systems Cabinet with Power Unit
- Advantx Console
- Acquisition Workstation (AWS) with Monitor, Keyboard, Mouse, Bar Code Reader and optional CDROM Writer.
- Enclosure assembly for the Workstation with Mini−tower and Uninterruptable Power Supply (UPS).

1-4 HHS Compliance Compatibility List

Product Category	Product Description	Model Number
X−ray Control	Advantx Operator Console	2224559
	SCPU Generator	2213251 2213251−2 2213251−3 2213251−4
X−ray Tube Housing (Casing)	MX−100	46−155400G46
Beam Limiting Device (Collimator)	AL01C Auto Collimator	2266999
41cm Digital Detector	Digital Radiographic Detector	2200286
Table	Table	2259988−2
Extended Wallstand Stretcher (optional)	Stretcher	2389323
Wallstand	Wallstand	2291655
Extended Wallstand	Extended Wallstand	2291655−5

Note: The OCS console is not a certified component. However, it is HHS sensitive. Refer to the service manual for replacement procedure.

1-5 Responsibility of Purchaser/Customer

To ensure the installation of a Revolution XR/d System meets the purchaser or Customer expectations, it is important to determine who will take responsibility for various items in the course of the system installation process. To aid you in determining these responsibilities, review the following checklists with the customer and assign responsibilities as appropriate:

- Tools and Equipment
- Pre−Installation Checklist
- Networkflow Audit

Contract Changes

Be sure to inform the customer that the cost of any alterations or modifications not specified in the sales contract are the responsibility of the customer.

1-6 Responsibility of Purchaser

The purchaser is responsible for the "Pre–Installation" which includes the procurement and installation of all required materials and services in the room before delivery of the product and associated components. This responsibility includes the following:

- Room floor, ceiling, and wall finish
- Provision of suitable support structure in the floor, walls, or ceiling as necessary for the mounting of the product and components (including shelf for workstation)
- Room lighting
- Power supply of the required voltages including an emergency–off safety switch in the room
- Installation of junction boxes of proper size including covers and fittings at locations required by the installation plan
- Installation of conduit, duct and/or raceway
- Installation of non–electric services

1-7 Product Identification

Description and location of individual component rating plates is described in the Operator information.

1-8 Installation Tools and Test Equipment

The following specialty tools will be required for system installation:

- Hammer drill with bits
- Chalk line or equivalent
- Torque Wrench
- (2) #46–156940G1, Hoist assemblies (one set to be distributed to each district by headquarters)
- (2) 6′ (1.8 m) Step ladders
- (2) Steel measuring tapes, 12′ (3.5 m) and 50′ (15 m)
- (1) #46–316872G1, Water Level kit [(ELECTRA/LEVEL by Zircon International) or equivalent capable of +/– 1/8″ (3.2 mm) over 30 ft. (9.14 m)] with 30′ (9.14 m) of 3/8″ (9.5 mm) I.D. Plastic tubing (#46–136324P10).
- (1) Carpenter's level, 2′ (61 cm) long
- (1) #2237374, 12 point, 3/8″ size, 1/4 inch drive SAE type socket

SECTION 2
ROOM REQUIREMENTS

2-1 Environmental Requirements of Room

2-1-1 Relative Humidity and Temperature

TABLE 2–1
REVOLUTION XR/D – RELATIVE HUMIDITY AND TEMPERATURE REQUIREMENTS

PRODUCT OR COMPONENT	RELATIVE HUMIDITY (NON–CONDENSING)				TEMPERATURE (DEGREES C)			
	IN–USE		STORAGE		IN–USE		STORAGE	
	MIN.	MAX	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.
Advantx Console	20%	80%	5%	95%	5	40	–40	70
AWS (Acquisition workstation)	30%	80%	10%	85%	10	35	–20	60
Digital Detector	10%	–	10%	50%	10	40	5	45
Wall Stand/Extended Wall-stand	20%	80%	5%	95%	10	40	–40	70
Table	20%	85%	20%	95%	10	40	–18	70
Extended Wallstand Stretcher (optional)	20%	95%	20%	95%	10	40	–18	70
OTS	20%	85%	20%	95%	10	40	–18	70
Systems Cabinet	20%	80%	5%	95%	15	35	–40	70
TOTAL SYSTEM LIMITS	**20%**	**80%**	**10%**	**50%**	**15**	**35**	**5**	45

Limits for rates of change:

In–Use	Storage
< 10 degree C / hour	< 20 degree C / hour
< 30% / hour	< 30% / hour

Note: STORAGE values only refer to equipment that is still in shipping containers. If the equipment is partially or completely installed, refer to IN–USE values.

2-1-2 Atmospheric Pressure

TABLE 2–2
REVOLUTION XR/D – PRESSURE REQUIREMENTS

PRODUCT OR COMPONENT	PRESSURE			
	IN–USE		STORAGE	
	MIN.	MAX	MIN.	MAX.
Advantx Console	57 kPa	101.3 kPa	11.1 kPa	101.3 kPa
AWS	74.5 kPa	102 kPa	24.1 kPa	106 kPa
Digital Detector	70 kPa	102.5 kPa	70 kPa	102.5 kPa
Detector Support Assembly	70 kPa	102.5 kPa	11.5 kPa	106.2 kPa
Table	69 kPa	106 kPa	48 kPa	106 kPa
Extended Wallstand Stretcher (optional)	69 kPa	106 kPa	48 kPa	106 kPa
OTS	69 kPa	106 kPa	48 kPa	106 kPa
System Cabinet	70 kPa	101.7 kPa	11.5 kPa	101.7 kPa
Wall Stand/Extended Wall-stand	70kPa	106 kPa	12 kPa	106 kPa
TOTAL SYSTEM LIMITS	**75 kPa**	**101.3 kPa**	**70 kPa**	**101.3 kPa**

Limits for rates of change:

In–Use	Storage
< 1.8 hPA / hour	< 76 hPA / hour

Note: STORAGE values only refer to equipment that is still in shipping containers. If the equipment is partially or completely installed, refer to IN–USE values.

2-1-3 Heat Output

TABLE 2–3
REVOLUTION XR/D HEAT OUTPUT

PRODUCT OR COMPONENT	HEAT OUTPUT (BTU/hr)	
	IN–USE	STAND–BY
Advantx Console	195	180
AWS (Computer + Monitor + UPS)	1550 or 2400 (with DIE computer option)	1550 or 2400 (with DIE computer option)
Wall Stand/Extended Wallstand Total (Conditioner + Power Supply + Detector)	7170	820
Table w/detector, conditioner, and power supply	7450	1100
OTS& Collimator	1500	500
Systems Cabinet	1000	1000
TOTAL SYSTEM OUTPUT	**12,000 or 12,850 (with DIE computer option)**	**5,200 or 6,050 (with DIE computer option)**

Note: Heat dissipation by X–ray tube not included.

2-1-4 Acoustic Output

TABLE 2–4
REVOLUTION XR/D ACOUSTIC OUTPUT

PRODUCT OR COMPONENT	SOUND OUTPUT (dBA)	
	IN–USE (measured 1m from any point in system)	STAND–BY (measured 1m from any point in system)
System	< 60	< 55

2-1-5 Light Specification

The AWS monitor screen is adjusted for an optimum ambient light level of 50 lux.

2-1-6 Magnetic/Electrical Field Sensitivity

The Revolution XR/d system is certified to IEC601–1–2 as follows:

- Radiated and Conducted Emissions. The Revolution XR/d system is certified to CISPR 11, Class A, Group 1
- Electro Static Discharge Immunity. The Revolution XR/d system is certified to IEC 1000–4–2:

  Air Discharge: 8kV — Level 1 Response
  Contact and Coupling Plane: 3 kV — Level 1 Response

- Radiated Electric Field Immunity

  The Revolution XR/d system is certified to IEC 1000–4–3
  3 Volts/meter , 80% modulation — Level 1 Response

- Electrical Fast Transient Immunity. The Revolution XR/d system is certified to IEC 1000–4–4 :

  Power Lines: 1 kV, 2 kV — Level 1 Response
  Interconnect Cables: 500 V — Level 1 Response

- Electrical Surge Immunity. The Revolution XR/d system is certified to IEC 1000–4–5

  Differential Coupling: 500 V, 1 kV
  Level 2 Response on ADS workstation
  (UPS orange LED flickers) @ 500 V
  Level 1 Response on all other subsystems

  Common Mode Coupling: up to 2 kV   Level 2 Response on ADS workstation
  (UPS orange LED flickers)
  Level 2 Response on ADS monitor
  Level 1 Response on all other subsystems

2-1-7 Radiation Protection

Because X-ray equipment produces radiation, special precautions may need to be taken or special site modifications may be required. The General Electric Company does not make recommendations regarding radiation protection. It is the purchasers responsibility to consult a radiation physicist for advise on radiation protection in X-ray rooms.

2-2 Structural Requirements

2-2-1 Door Size Requirements

Minimum door sizes also apply to hallway and elevator. See Section 3, Product Characteristics, for additional details.

Door Height

The minimum door height to accommodate the System cabinet on its dolly is 2.1 m (82 in).

Door Width

The minimum door width to accommodate the System cabinet on its dolly is 1.1 m (42 in).

The minimum door width is calculated based on a straight–in approach requiring a 2.5 m (8 ft) wide corridor. Minimum widths will change based on narrower corridors.

2-2-2 Floor Requirements

The preferred method of installing the table is using provided floor anchors. The provided floor anchors can be used in all seismic zone.

⚠ CAUTION

Potential for Injury and/or Equipment Damage:

Anchors must be a minimum of 150mm from any concrete edge including ducts and cracks. In addition, the general condition of the concrete in the immediate mounting area should be inspected to ensure that anchors will be set in good quality concrete.

Hard Surfaced Floor Requirement

If flooring is not hard-surfaced, provide steel bearing plates 3.2 mm (1/8 in) thick, 127 x 775 mm (5 x 30.5 in) to place under the High Voltage transformers. Steel plates are also recommended if the transformer is placed within 203 mm (8 in) of a wall.

Floor Requirements when using provided Floor Anchors

The floor bearing the Revolution XR/d system must be concrete and the thickness of the floor is at least **150mm (5.9 in.)** .

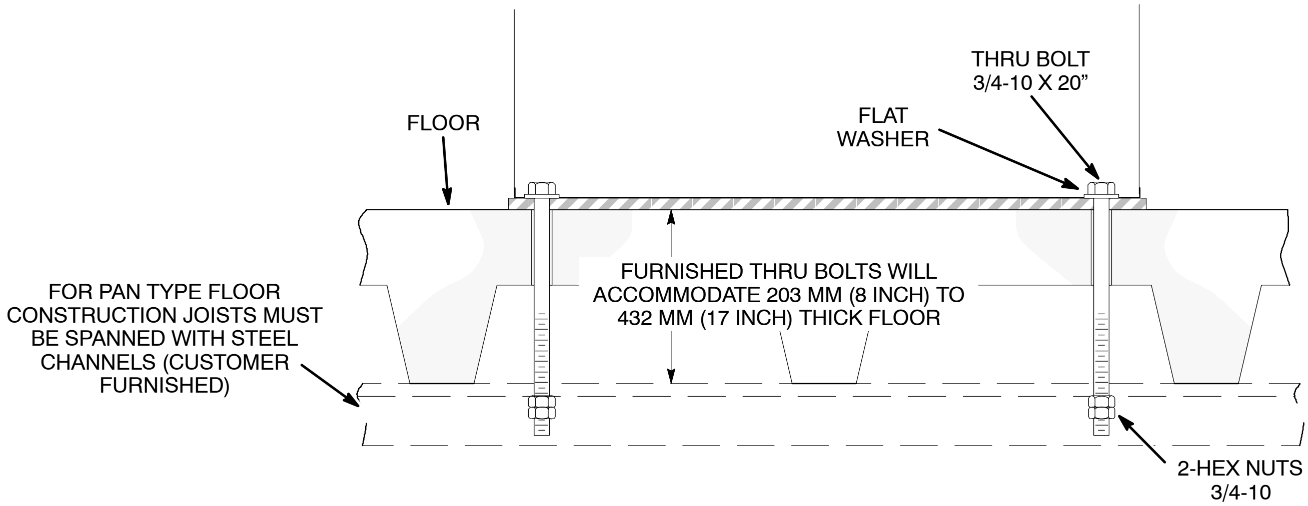
The Table Assembly is placed on the floor, which must accept the weight and the weight/area defined in 3–2.

- The weight of the complete table is 344 kgs (647 lbs).
- The ground surface must be rather horizontal.
- The Revolution XR/d Table system must be fixed on the floor.

Pan Type Floor Construction Requirement

For Pan type floor construction, steel channels must be designed by a local structural engineer to span floor joists. See Illustration 2–1.

ILLUSTRATION 2–1
THRU BOLT FLOOR MOUNTING (PAN TYPE FLOOR CONSTRUCTION)



2-2-3 Ceiling Requirements

Description

Stationary rails are designed for top (ceiling) mounting. Rails can be ordered and are supplied in 4″ (10.2 cm) increments between 134″ (3.4 m) and 222″ (5.64 m), plus a 228″ (5.79 m) length totaling 24 different sizes. The choice of length depends on room size, configuration and the possible presence of obstructions.

Complete details of room dimensions must be known when planning an installation. Work with the architect or building engineer and obtain approval from the customer before proceeding with the layout plan.

Methods of support that will permit attachment to structural steel or through bolts in concrete construction should be favored. Do not use anchors in direct tension.

Each rail has mounting holes on 26″ (66 cm) centers with the first hole located 2″ (5.1 cm) from the rail end. The last hole is located either 2″ (5.1 cm) or 4″ (10.2 cm) from the other end with a variable space of less than 26″ (66 cm) between it and the second last hole.

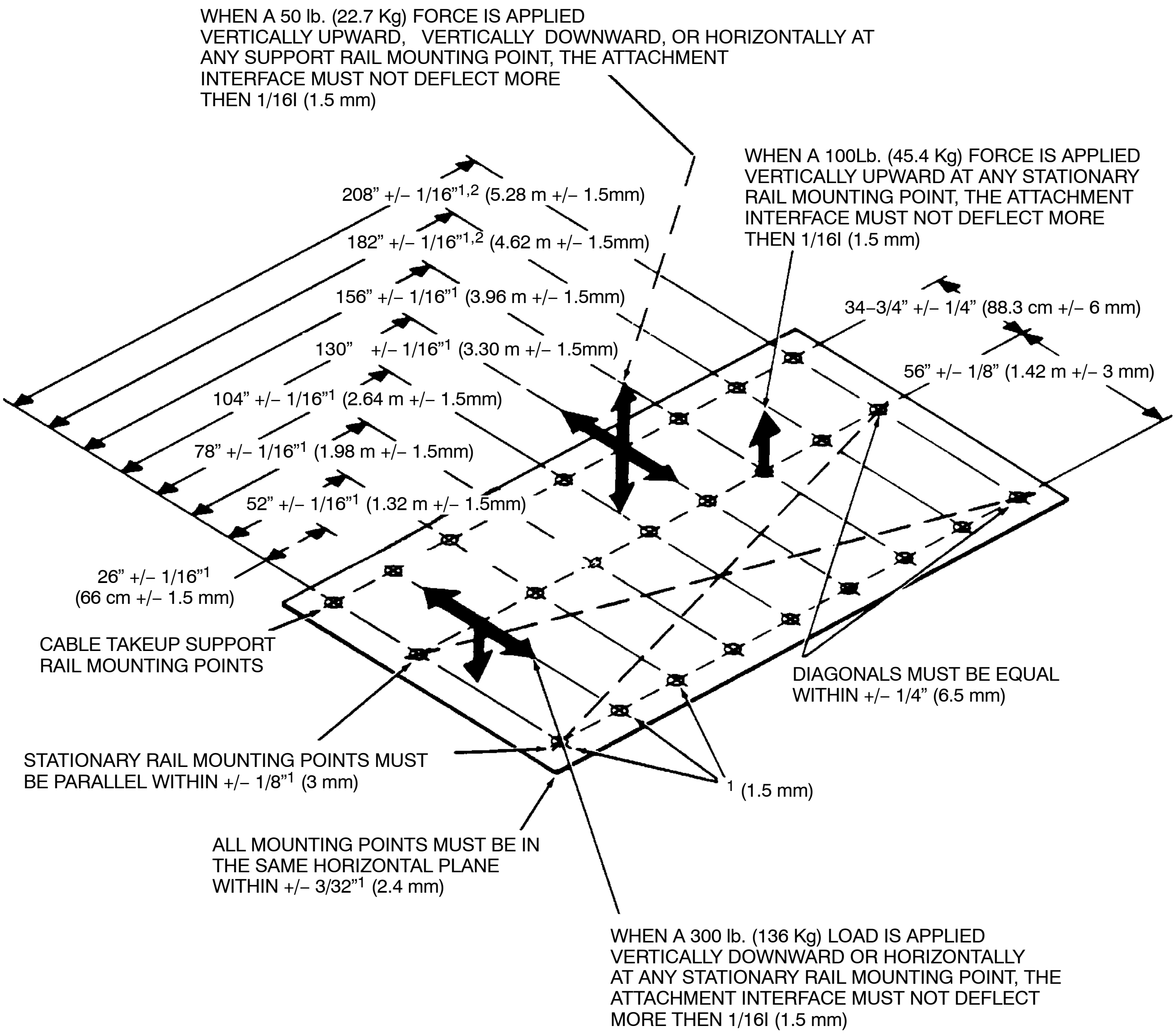
⚠ CAUTION **Potential for Injury and/or Equipment Damage:**

Rails are mounted on 1/2″ (12.7 mm) bolts. Maximum load per bolt is 350 lbs. (159 kg); however, each mounting bolt must not “pull–out” or otherwise fail under a vertically downward “dead” load of 1,400 lbs. (636 kg).

Referring to the layout drawings, the +/– 1/8″ (3 mm) requirement for parallelism of the stationary rail is critical. Therefore, great care must be exercised in locating the mounting points. Illustrations 2–2 and 2–3 outline requirements that the stationary rail mounting interface must meet.

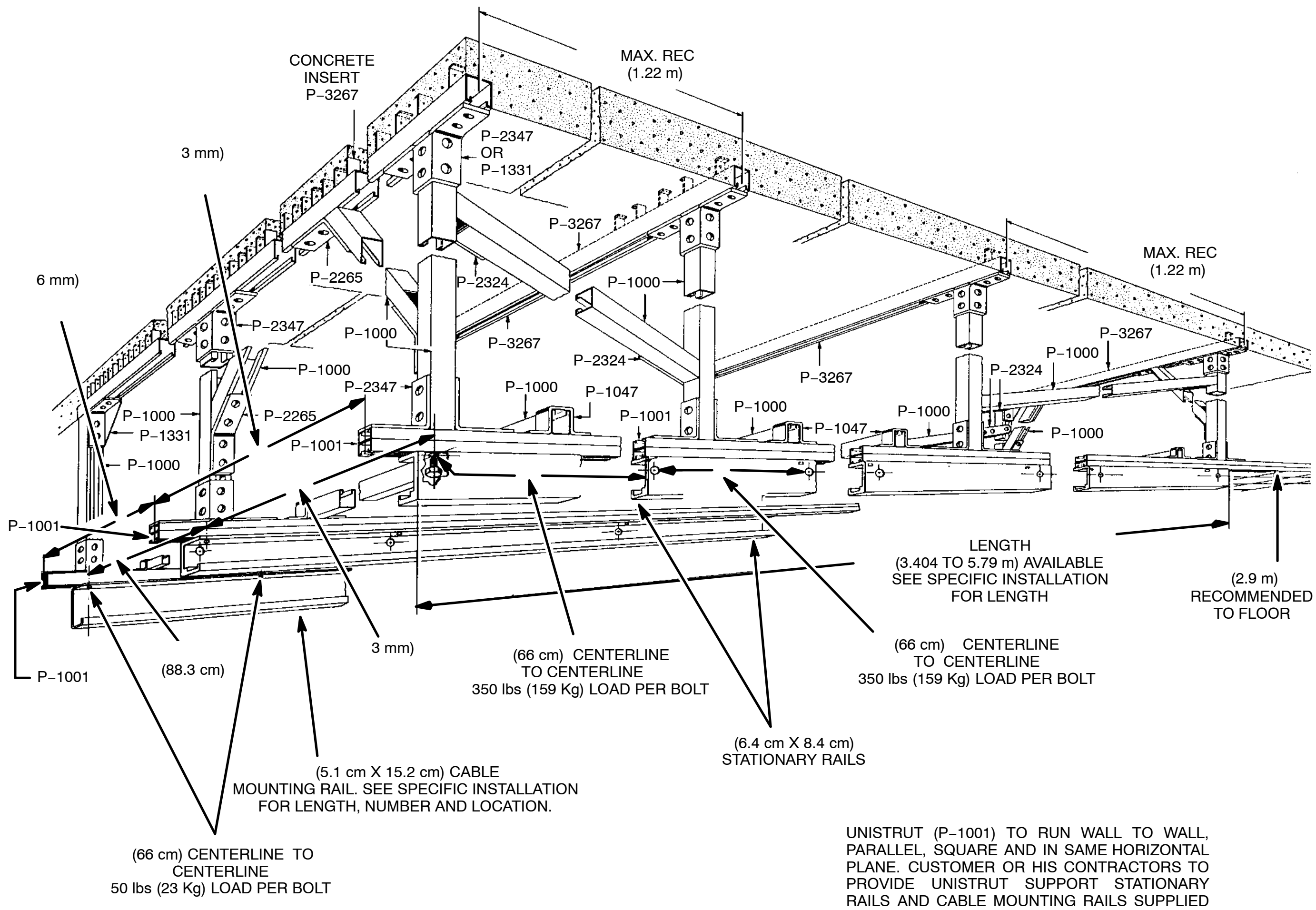
For low ceiling height, the stationary rails may be mounted directly to the ceiling slab or to flush–mounted Unistrut or similar structure. For higher rooms in which a false ceiling is to be used, the stationary rails may be attached to rigid vertical members hung from the ceiling slab. A supplementary channel may be secured to the bottom of the vertical members to facilitate provision for mounting holes. A Unistrut system or equivalent is a convenient type of support to employ. Refer to Illustration 2–3.

ILLUSTRATION 2–2
SPECIFICATIONS FOR A TYPICAL 17′–10″ (5.44 M)
STATIONARY RAIL MOUNTING INTERFACE
(BOTH RAILS CEILING MOUNTED)



NOTES: 1. NONE CUMULATIVE ERROR.
2. SPACE BETWEEN LAST 2 HOLES MAY BE LESS THAN 26I (66 cm).

ILLUSTRATION 2–3
SUGGESTED UNISTRUT STRUCTURE FOR OTS SUSPENSION



UNISTRUT (P–1001) TO RUN WALL TO WALL, PARALLEL, SQUARE AND IN SAME HORIZONTAL PLANE. CUSTOMER OR HIS CONTRACTORS TO PROVIDE UNISTRUT SUPPORT STATIONARY RAILS AND CABLE MOUNTING RAILS SUPPLIED BY GE MEDICAL SYSTEMS.

2-2-4 Walls Requirements

In addition to providing wall space for the Systems cabinet, a 1 meter (3 ft) space must be available within the exam room to hang the image quality phantom carrier.

2-2-5 Seismic Requirements

Seismic Kits – Consult local building and seismic codes for special mounting requirements.

2-3 Power and Grounding Requirements

2-3-1 Line Voltage and Frequency Specifications

- Input voltage is 3 phase, 380V to 480V +/– 10% and voltage frequency is 50 Hz to 60 Hz nominal with a rate of +/– 3%. Refer to Tables 2–5 and 2–6.
- Input voltage connection between the site source and the Main Circuit Breaker may be connected either:
  > **Wye** – 5–wire: 3 phase + neutral + ground
  > **Delta** – 4–wire: 3 phase (grounded B phase) + neutral
- Input voltage connection between the Main Breaker and the SCPU Cabinet is required to be 4–wire (3 phase + ground).

2-3-2 kVA Load Characteristics

TABLE 2–5
SCPU 65 POWER SUPPLY

SCPU 65						
Phase	3	3	3	3	3	3
Nominal line voltage (Vac)	380	400	420	440	460	480
Voltage range (Vac)	+/–10 %	+/–10 %	+/–10 %	+/–10 %	+/–10 %	+/–10 %
Maximum instantaneous power (1) (kVA)	99.2	99.2	99.2	99.2	99.2	99.2
Power factor	0.73	0.73	0.73	0.73	0.73	0.73
Momentary line current (1) (Amp)	151	143	136	130	125	119
Continuous line current (Amp)	15.8	15.0	14.3	13.6	13.0	12.5
(1) Based on momentary power demand in kVA/0.1 second max. Maximum kVA requires line voltage regulation to be less than or equal to 6%.						

TABLE 2–6
SCPU 80 POWER SUPPLY

SCPU 80						
Phase	3	3	3	3	3	3
Nominal line voltage (Vac)	380	400	420	440	460	480
Voltage range (Vac)	+/–10 %	+/–10 %	+/–10 %	+/–10 %	+/–10 %	+/–10 %
Maximum instantaneous power (1) (kVA)	118	118	118	118	118	118
Power factor	0.73	0.73	0.73	0.73	0.73	0.73
Momentary line current (1) (Amp)	180	170	162	155	148	144
Continuous line current (Amp)	15.8	15.0	14.3	13.6	13.0	12.5
(1) Based on momentary power demand in kVA/0.1 second max. Maximum kVA requires line voltage regulation to be less than or equal to 6%.						

Note: Low line conditions may inhibit some high kVp techniques. The SCPU automatically establishes these inhibits based on actual line conditions and regulation.

Phase-Balance: Phase-to-phase voltages must be within +2% of lowest phase-to-phase voltage. Maximum allowable transient voltage excursions are 2-1/2% of rated line voltage at a maximum duration of 5 cycles and frequency of 10 times per hour.

2-3-3 Maximum Line Impedance

TABLE 2–7
MAXIMUM LINE IMPEDANCE

	Apparent Resistance of Feed Circuit in ohms per phase wire (measured on point B)					
Input Voltage	380	400	420	440	460	480
SCPU 65	0.15	0.16	0.18	0.20	0.22	0.24
SCPU 80	0.10	0.11	0.12	0.14	0.15	0.16

2-3-4 Fuse/Circuit Breaker Specifications

NOTICE

Potential for Equipment Damage:

The main circuit breaker is supplied by the customer and must be sized in accordance to the local regulation. If the PDP is equipped with a differential calibrated to 30 mA, the latter must be at least with class A (for pulse waveform current).

For instance with a 380 V, 3 phases, electrical network the circuit breaker must be sized as follows:

- **For SCPU 65: thermal circuit breaker = 40 A with a magnetic breaker at 480 A +/– 20%**
- **For SCPU 80: thermal circuit breaker = 50 A with a magnetic breaker at 600 A +/– 20%**

TABLE 2–8
MAXIMUM LINE CURRENTS AND MINIMUM RECOMMENDED CIRCUIT BREAKER RATINGS

The SCPU power unit does not have remote trip capability or an internal circuit breaker. These functions are the responsibility of the customer.

AC LINE VOLTAGE		SCPU 65			SCPU 80		
		CB* AMPS	CURRENT (AMPERES)		CB* AMPS	CURRENT (AMPERES)	
NOM	MIN		NOM*	MAX**		NOM*	MAX**
380	342	80	156	173	110	208	234
400	360	80	148	164	100	198	220
420	378	80	141	157	100	188	209
440	396	70	134	149	90	179	199
460	414	70	128	142	80	171	190
480	432	70	123	137	80	164	182

* Minimum circuit breaker ratings are based on 50% of the momentary line currents at nominal line voltage per NFPA 70, Article 517–73 (1990).
** Maximum momentary line currents at minimum line voltage per 21CFR 1020.

TABLE 2–9
FEEDER TABLE SCPU 65

RECOMMENDED FEEDER SIZES IN AWG FOR SCPU 65 GENERATOR

RUN LENGTH IN FEET	POWER SUPPLY VOLTAGE					
	342 – 418 380	360 – 440 400	378 – 462 420	396 – 484 440	414 – 506 460	432 – 528 480
50	* 1 (1/0)	* 2 (1/0)	* 2 (1/0)	* 3 (1/0)	* 3 (1/0)	* 3 (1/0)
100	* 1 (1/0)	* 2 (1/0)	* 2 (1/0)	* 3 (1/0)	* 3 (1/0)	* 3 (1/0)
150	1 (1/0)	1 (1/0)	2 (1/0)	2 (1/0)	3 (1/0)	3 (1/0)
200	2/0 (2/0)	1/0 (1/0)	1/0 (1/0)	1 (1/0)	1 (1/0)	2 (1/0)
250	3/0 (3/0)	3/0 (3/0)	2/0 (2/0)	2/0 (2/0)	1/0 (1/0)	1/0 (1/0)
300	250M (250M)	4/0 (4/0)	3/0 (3/0)	3/0 (3/0)	2/0 (2/0)	2/0 (2/0)
350	350M (350M)	300M (300M)	4/0 (4/0)	4/0 (4/0)	3/0 (3/0)	3/0 (3/0)
400	400M (400M)	350M (350M)	300M (300M)	250M (250M)	4/0 (4/0)	3/0 (3/0)

* MINIMUM SIZE FOR CIRCUIT BREAKER, NEC ARTICLE 517–73.
( ) MINIMUM SIZE GROUND WIRE TO BE RUN WITH FEEDER SHOWN.

TABLE 2–10
FEEDER TABLE SCPU 80

RECOMMENDED FEEDER SIZES IN AWG FOR SCPU 80 GENERATOR

RUN LENGTH IN FEET	POWER SUPPLY VOLTAGE					
	342 – 418 380	360 – 440 400	378 – 462 420	396 – 484 440	414 – 506 460	432 – 528 480
50	* 4 (1/0)	* 4 (1/0)	* 6 (1/0)	* 6 (1/0)	* 6 (1/0)	* 6 (1/0)
100	* 4 (1/0)	* 4 (1/0)	4 (1/0)	4 (1/0)	* 6 (1/0)	* 6 (1/0)
150	2 (1/0)	2 (1/0)	3 (1/0)	3 (1/0)	4 (1/0)	4 (1/0)
200	1/0 (1/0)	1/0 (1/0)	1 (1/0)	2 (1/0)	2 (1/0)	2 (1/0)
250	2/0 (2/0)	2/0 (2/0)	1/0 (1/0)	1/0 (1/0)	1 (1/0)	1 (1/0)
300	3/0 (3/0)	3/0 (3/0)	2/0 (2/0)	2/0 (2/0)	1/0 (1/0)	1/0 (1/0)
350	250M (250M)	4/0 (4/0)	3/0 (3/0)	3/0 (3/0)	2/0 (2/0)	2/0 (2/0)
400	300M (300M)	250M (250M)	4/0 (4/0)	4/0 (4/0)	3/0 (3/0)	2/0 (2/0)
* MINIMUM SIZE FOR CIRCUIT BREAKER, NEC ARTICLE 517–73. ( ) MINIMUM SIZE GROUND WIRE TO BE RUN WITH FEEDER SHOWN.						

2-3-5 Customer Supplied Power

This section provides additional data regarding power circuits provided by the customer and internal electrical circuits to supply the correct power to the RAD system.

Illustration 2–4 shows the room power supply installed at customer expense with a DMD in compliance with Section 2-3-4.

Legend for Illustration 2–4 (page 17):

1 Feeder wire and grounding cable supplied by the customer.

2 The Advantx SCPU is supplied by GEMS with an AC Distribution Panel located inside the Lower Cabinet.

3 Cables are to be provided by customer (inlet to the SCPU with 2 m [6.56 feet] held over).

PDP Power distribution panel for powering X–ray equipment (not supplied by GEMS).

DMD Thermomagnetic differential circuit breaker.

C Contactor

Y Contactor remote–control ON/OFF impulse buttons, lockable on “OFF”, with indicator lamps (Red = ON/Green = OFF) located near access door, 1.5 m (4.92 ft) above floor.

B Inlet for power supply cable on plinth in connecting box (depending of length between PDP and SCPU Cabinet).

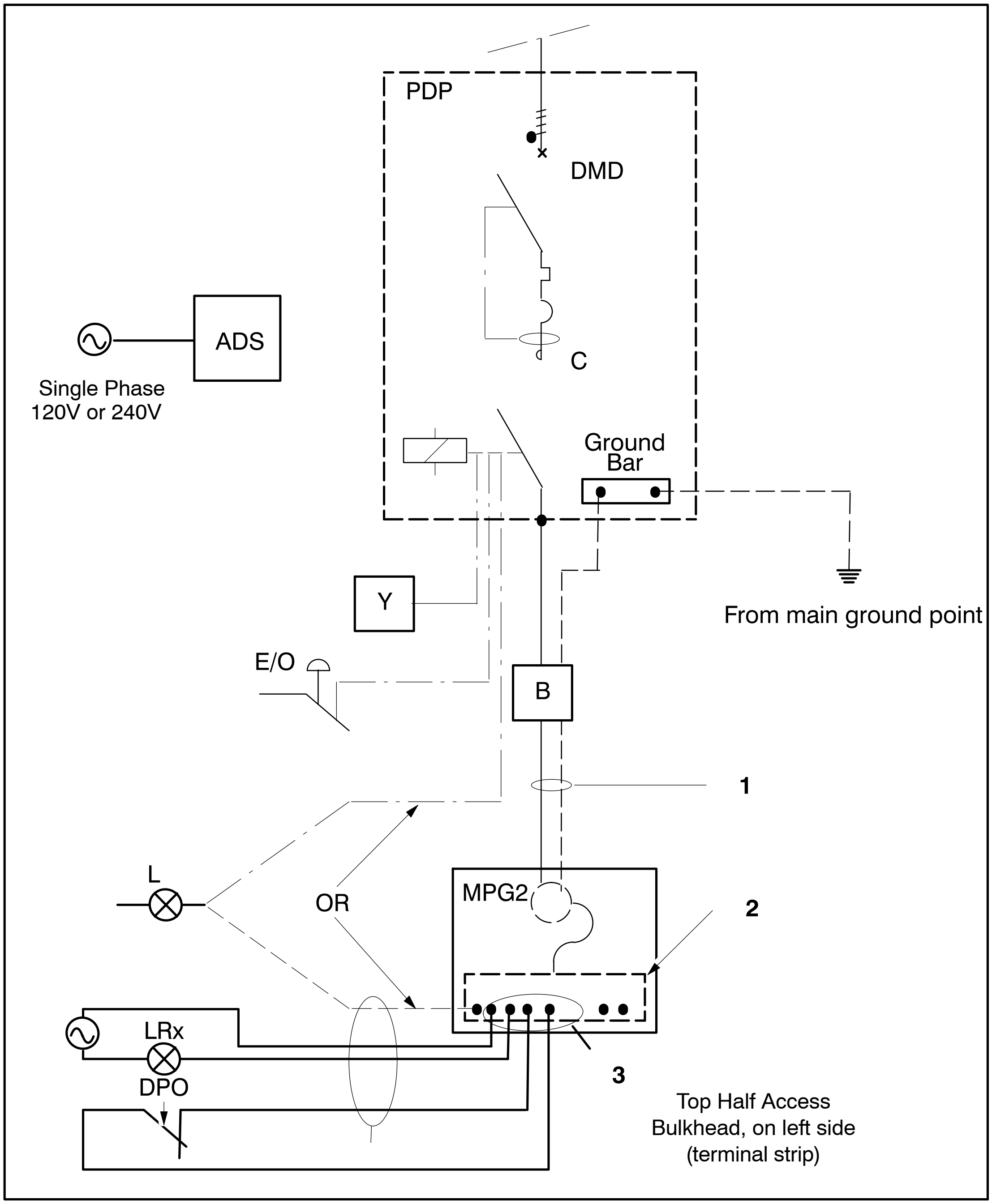
E/O Emergency off button located near access door, 1.5 m (4.92 ft) above floor.

L Red continuous glow or flashing presence indicator lamp located above the access door, near LRx. Voltages: 220 V in Europe/120 V in USA with bulb 25 W maxi.

LRx Yellow X–ray emission indicator lamp above the room access door. 220 V in Europe/120 V in USA with 25 W max. bulb (in accordance with local norms or making of rules).

DPO Open–door detector (in accordance with local norms or making of rules).

ILLUSTRATION 2–4
ROOM POWER SUPPLY INSTALLED AT CUSTOMER'S EXPENSE



2-3-6 Isolation Transformer Requirements

For compliance with IEC 601–1 and 601–2–7, the system must be connected to an isolation transformer meeting the power demands specified in this section and with IEC 601–1.

Applicable Documents

- IEC 601–1. "Medical Electrical Equipment—Part 1: General Requirements for Safety"
- 806–1, "Safety – Protective Earthing Criteria (Grounding)"
- 806–2, "Safety – Electrical Leakage Current"

Electrical Requirements

Input Voltage

- 324–528 VAC three phase (360–480 VAC nominal voltage)
- The input shall be a delta configuration/ Taps will be provided on the input so that over the input voltage range the output can be set to 480 VAC.
- Input Frequency: 47–63 Hz

Earth Leakage Current

Less than 5 mA under normal conditions and less than 10 mA under single fault conditions.

Output Voltage Characteristics

The output voltage shall be 277/480V wye with grounded neutral.

Load Regulation

Less than or equal to 2.5% from no load to 175 KVA with .80 as the power factor.

Input Protection

The input protection for the three phases is shown in the Table 2–11. The protection shall be provided by the use of a circuit breaker which shall act as a disconnect.

TABLE 2–11
INPUT PROTECTION

Nominal Primary Voltage	Protection – Circuit Breaker
360 – 480 VAC	150A

Output Protection

The provided output protection is shown in Table 2–12.

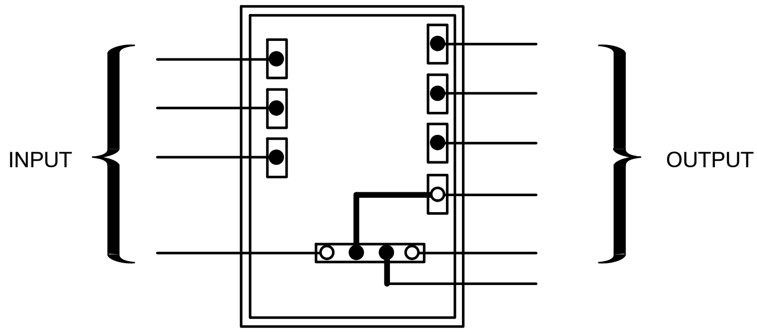
TABLE 2–12
OUTPUT PROTECTION

Secondary Voltage	Protection – Fuse
480 VAC	150A

Ground Connections

The input and output grounding connections shall connect to the same grounding block. The steel panel of the equipment shall not be used as part of the grounding path of the input and output grounds. The grounding block shall be bonded to the chassis of the device with a low impedance connection. See Illustration 2–5.

ILLUSTRATION 2–5
GROUND CONNECTIONS



Transformer Configuration

The transformer circuit shall be a delta – wye configuration. The input (primary) circuit configuration shall be a Delta and the output (secondary) circuit configuration a wye.

Input Terminals

The input terminals shall accept wire sizes from 6 AWG to 500 MCM.

Output Terminals

The output terminals shall accept wire sizes from 6 AWG to 500 MCM.

Environmental requirements

Ambient Temperature

The transformer shall operate from +10°C to +50°C.

Heat Output

Heat output shall be less than approximately 1400 btu/hour.

Audible Noise

The noise shall be appropriate for hospital room environments. The Audible noise shall not exceed 50 db(A) when measured by the requirements of NEMA ST20 (or equivalent)

Cooling

Cooling shall be by natural convection. Fans will not be used.

Safety and Regulatory Requirements

IEC 601–1,"Medical Electrical Equipment – Part 1: General Requirements for Safety"

2-4 Network Requirements

Network connection is made at the AWS enclosure.

- 10BASE Tx Network connection is acceptable
- 100BASE Tx Network connection is preferred

Note: If using GE PACS LITE BOX software, the revision must be 6.1d02 or greater. Older versions will not work on this system.

For DICOM information, refer to: Revolution XR/d Acquisition Workstation Conformance Statement for DICOM V3.0.

SECTION 3
PRODUCT CHARACTERISTICS

3-1 Component Dimensions and Weights

See Tables 3–1 and 3–2 and associated illustrations to obtain the physical characteristics.

TABLE 3–1
PRODUCT/PHYSICAL CHARACTERISTICS

PRODUCT OR COMPONENT	DIMENSIONS			REFERENCE DRAWING*
	Width	Depth	Height	
Advantx Console	500 mm (19.7 in)	115 mm (4.5 in)	306 mm (12.0 in)	See Illustration 3–2
AWS Monitor	398 mm (15.7 in)	218 mm (8.6 in)	445 mm (17.5 in)	See Illustration 3–3
CD–ROM Recorder (external)	170 mm (6.7 in)	327 mm (12.9 in)	68 mm (2.7 in)	none
AWS Enclosure Asm.	460 mm (18.1 in)	655 mm (25.8 in)	650 mm (25.6 in)	See Illustration 3–4
Table Assembly	2200 mm (86.6 in)	930 mm (36.6 in)	575–820 mm (22.6–32.3 in)	See Illustrations 3–5, 3–6, and 3–7
Extended Wallstand Stretcher (optional)	2150 mm (84.7 in)	870 mm (34.25 in)	705 mm (27.75 in)	See Illustrations 3–8
Stationary Rail (5.79 m) each	5.79 m (19 ft)	62.3 mm (2.45 in)	84.3 mm (3.32 in)	See Illustrations 3–9, 3–10, 3–11, 3–12, 3–13 and 3–14
2 Meter Bridge	2133 mm (84 in)	655.3 mm (25.8 in)	158.7 mm (6.25 in)	See Illustrations 3–9, 3–10, 3–11, 3–12, 3–13 and 3–14
3 Meter Bridge	3073 mm (121 in)	655.3 mm (25.8 in)	158.7 mm (6.25 in)	See Illustrations 3–9, 3–10, 3–11, 3–12, 3–13 and 3–14
Overhead Tube Support incl.: carriage, collimator, tube, and UIF	940 mm (37 in)	508 mm (20 in)	927 mm (36.5 in)	See Illustrations 3–9, 3–10, 3–11, 3–12, 3–13 and 3–14
Systems Cabinet	1015 mm (40.0 in)	470 mm (18.5 in)	1980 mm (80.0 in)	See Illustrations 3–15 and 3–16
Detector Support Assembly	622 mm (24.5in)	416 mm (18.5 in)	526 mm (21.0 in)	See Illustration 3–17
Grid Holder	544 mm (21.4in)	237 mm (9.35 in)	599 mm (23.6 in)	See Illustration 3–18
Receptor Stand	860 mm (33.9 in)	650 mm (25.6 in)	2286 mm (90.0 in)	See Illustrations 3–19, 3–20, 3–21
Extended Receptor Stand	860 mm (33.9 in)	1387 mm (54.61 in)	2286 mm (90.0 in)	See Illustrations 3–22, 3–23, 3–24
***Showing: Mounting Holes, Cable Entrance, Air Vents, Service Access, Center of Gravity**				

TABLE 3–2
PRODUCT/PHYSICAL CHARACTERISTICS

PRODUCT OR COMPONENT	WEIGHT	WEIGHT/OCCUPIED AREA kg/m^2 (lb/ft^2)	RECOMMENDED MOUNTING INFORMATION
Advantx Console	7.3 kg (16.1 lbs)	NA	Shelf/Table mount
AWS Monitor	8.5 kg (18.7 lbs)	NA	Shelf/Table mount (not anchored)
CD–ROM Recorder (external)	2.6 kg (5.7 lbs)	NA	Shelf/Table mount (not anchored)
AWS Enclosure Assembly: Ready for DIE PC option – With DIE PC option installed –	64 kg (141 lbs) 73 kg (161 lbs)	16 (35.3) point contact 18.3 (40.3) point contact	Floor mount (on casters – not anchored)
Table Assembly	344 kg (757 lbs)	394 (81)	Mount on floor
Extended Wallstand Stretcher (optional)	102 kg (225 lbs)	25.5 (56.25) point contact	Not anchored
Receptor Stand	260 kg (572 lbs)		1/2 in. x 5 3/4 inch Rawl anchors to floor (supplied)
Extended Receptor Stand	265 kg (584 lbs)		1/2 in. x 5 3/4 inch Rawl anchors to floor (supplied)
Detector Support Asm	30 kg (66.1 lbs)		Floor mount (not anchored) (located near Receptor stand base)
Stationary Rail (5.79 m)		NA	
2 Meter Bridge		NA	
3 Meter Bridge	64 kg (140 lbs)	NA	
2 Meter Cable Assembly	42 kg (93 lbs)	NA	
3 Meter Cable Assembly	49 kg (108 lbs)	NA	
Overhead Tube Support incl.: carriage, collimator, tube, and UIF	172 kg (377 lbs)	NA	
Systems Cabinet	385 kg (849 lbs)	854 (174)	5/16 in. or 8 mm (2) anchors to wall (Mounting hardware not provided by GEMS)
Grid Holder Assembly	15.5 kg (34 lbs)	NA	Mount on wall

3-2 Shipping Information

TABLE 3–3
SHIPPING DATA

PRODUCT OR COMPONENT	SHIPPING DATA				
	SHIPPING DIMENSIONS (APPROX.)			SHIPPING WEIGHT (APPROX.)	SHIPPING METHOD
	LENGTH	WIDTH	HEIGHT		
Advantx Console	864 mm (34.0)	560 mm (22.0)	610 mm (24.0)	9.5 kg (20 lbs)	box / skid
AWS Monitor	610 mm (24.0 in)	610 mm (24.0 in)	533 mm (21.0 in)	25 kg (55 lbs)	box / skid
AWS Enclosure: Ready for DIE PC option – With DIE PC option installed –	762 mm (30.0 in)	610 mm (24.0 in)	610 mm (30.0 in)	70 kg (154 lbs) 79 kg (174 lbs)	box / skid
Detector Asm	815 mm (32.0 in)	1020 mm (40.0 in)	560 mm (22.0 in)	68 kg (150 lbs)	padded box
Table Assembly	2388 mm (94 in)	1100 mm (43 in)	1100 mm (43 in)	575 kg (1265 lbs)	box / skid
Extended Wallstand Stretcher (optional)	2312 mm (91 in)	1042 mm (41 in)	940 mm (37 in)	164 kg (360 lbs)	box / skid
Stationary Rail (5.79m) each rail	5.92 m (233 in)	178 mm (7 in)	76 mm (3 in)	68 kg (150 lbs)	box
2 Meter Bridge	2210 mm (87 in)	737 mm (29 in)	178 mm (7 in)	63 kg (138 lbs)	box
3 Meter Bridge	3099 mm (122 in)	737 mm (29 in)	178 mm (7 in)	84 kg (185 lbs)	box
2 Meter Cable Assembly	1422 mm (56 in)	813 mm (32 in)	432 mm (17 in)	95 kg (210 lbs)	box/skid
3 Meter Cable Assembly	1829 mm (72 in)	813 mm (32 in)	432 mm (17 in)	109 kg (240 lbs)	box/skid
Overhead Tube Support incl.: carriage, collimator, tube, and UIF	1092 mm (43 in)	940 mm (37 in)	1207 mm (47.5 in)	223kg (490 lbs)	crate/skid
Systems Cabinet	630 mm (24.8 in)	1270 mm (50.0 in)	2090 mm (82.3 in)	455 kg (1000 lbs)	dolly – See Illustration 3–1
Receptor Stand	2440 mm (96.0 in)	940 mm (37.0 in)	1270 mm (50.0 in)	380 kg (836 lbs)	box / skid
Extended Receptor Stand	2440 mm (96.0 in)	940 mm (37.0 in)	1935 mm (76.2 in)	409 kg (901.7 lbs)	box / skid
Grid Holder	635 mm (25.0 in)	305 mm (12.0 in)	686 mm (27.0 in)	16.4 kg (36 lbs)	box

ILLUSTRATION 3–1
TYPICAL ILLUSTRATION SHOWING SHIPPING DOLLY DIMENSIONS

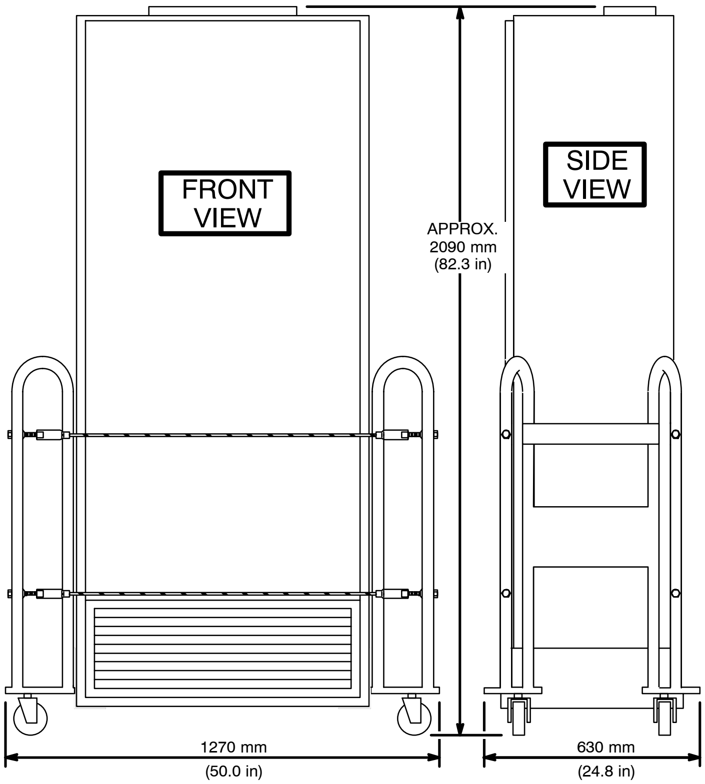


ILLUSTRATION 3–2
CONSOLE DIMENSIONS

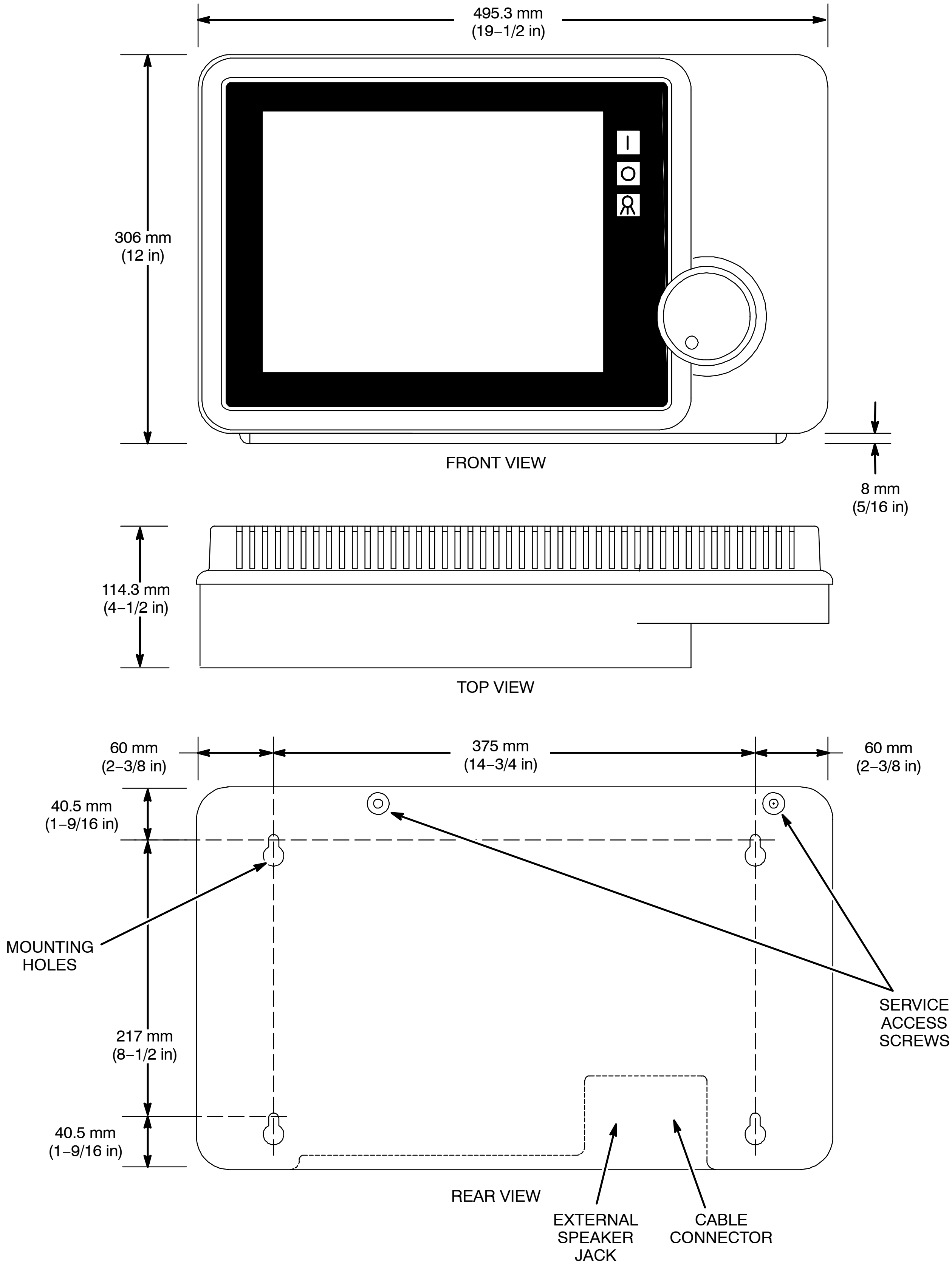


ILLUSTRATION 3−3
FLAT PANEL MONITOR DIMENSIONS

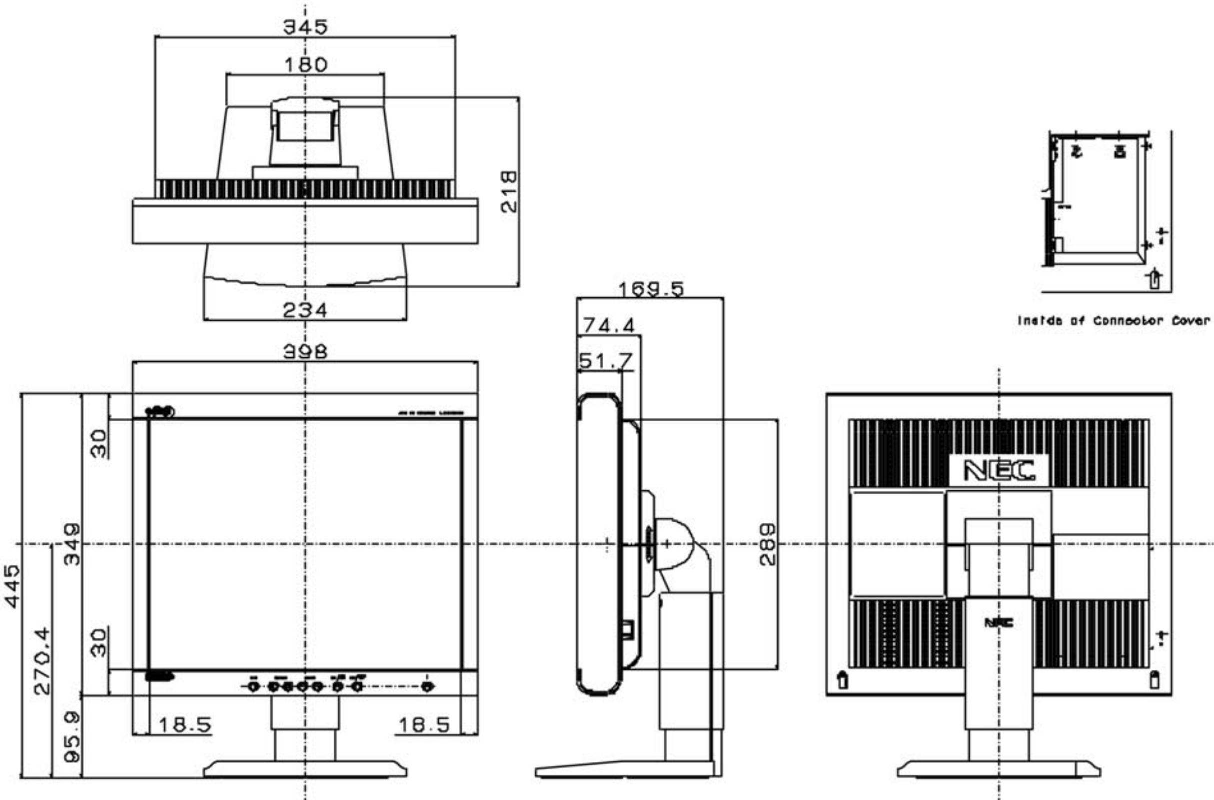


ILLUSTRATION 3–4
AWS ENCLOSURE ASSEMBLY DIMENSIONS

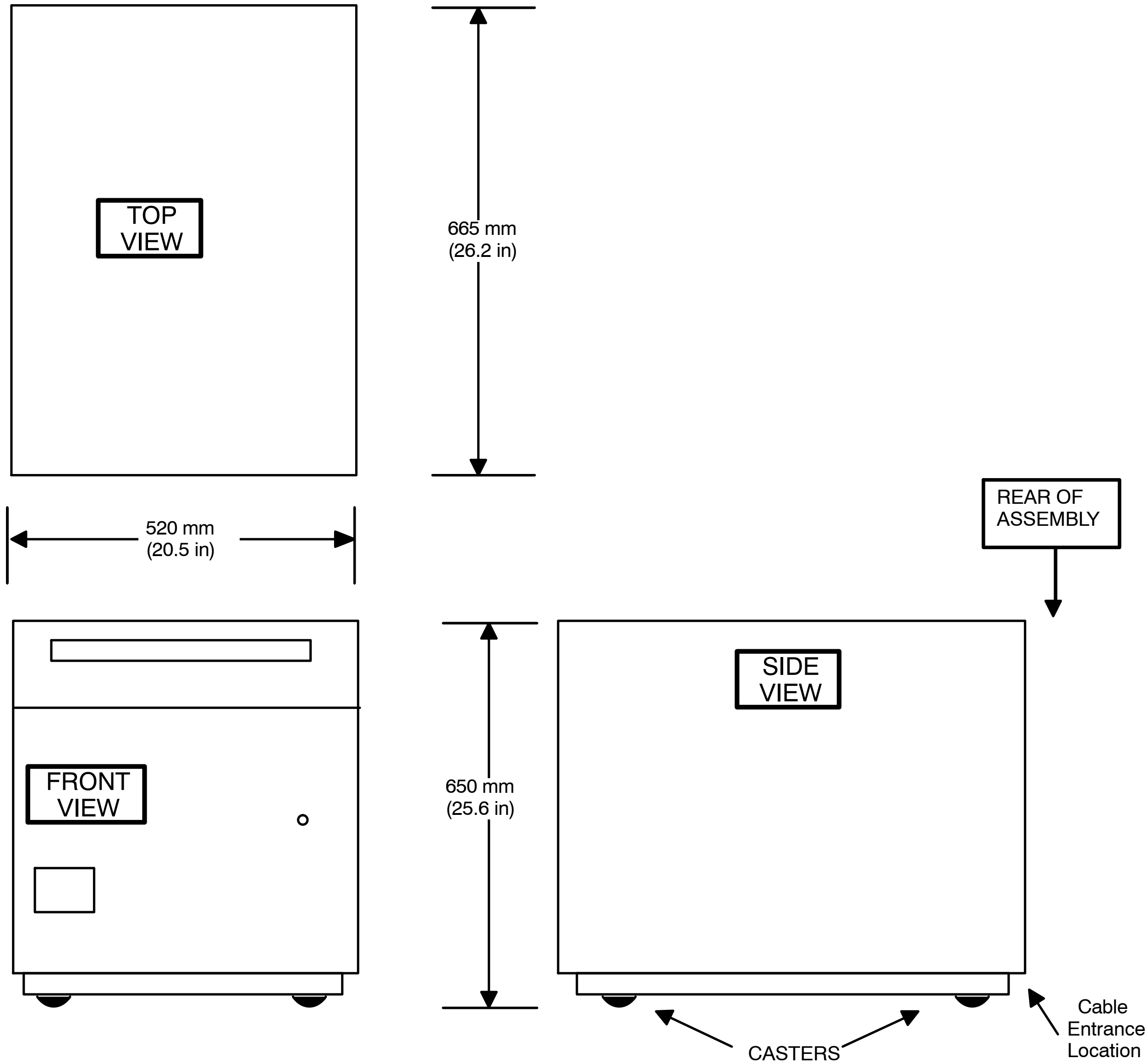
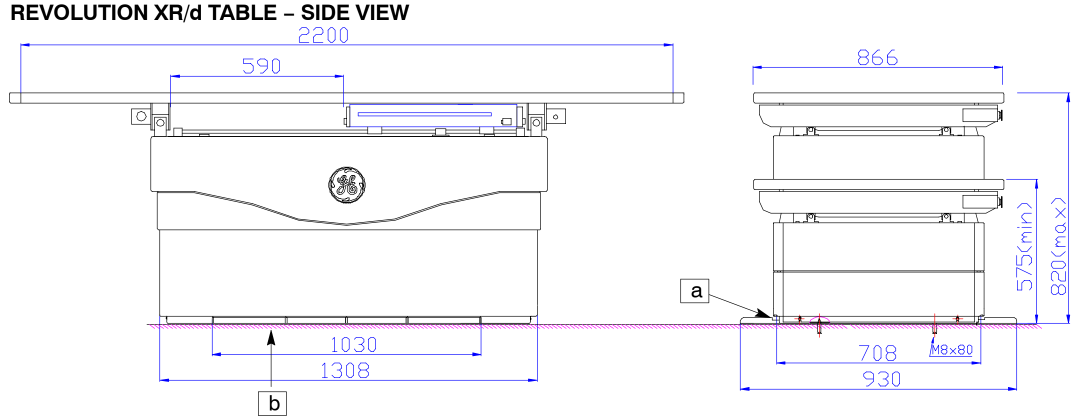


ILLUSTRATION 3–5
REVOLUTION XR/d TABLE – SIDE VIEW



Note: Table height in illustration is referred to elevating table.

ILLUSTRATION 3–6
REVOLUTION XR/d TABLE – TOP VIEW

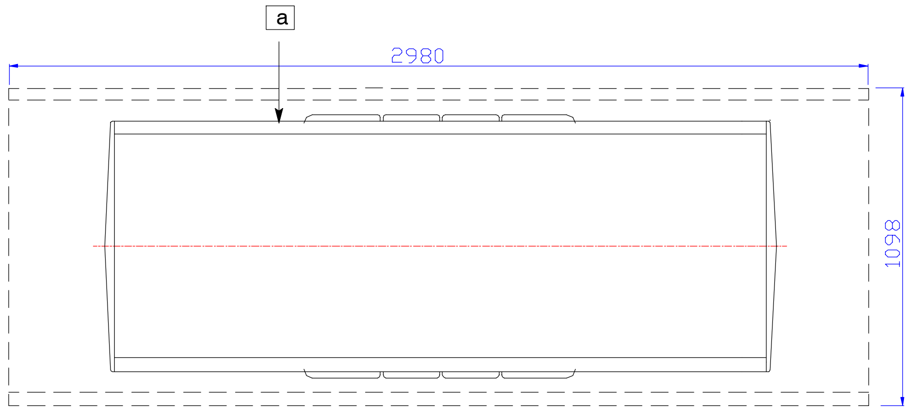


ILLUSTRATION 3–7
REVOLUTION XR/d TABLE BOTTOM PLATE

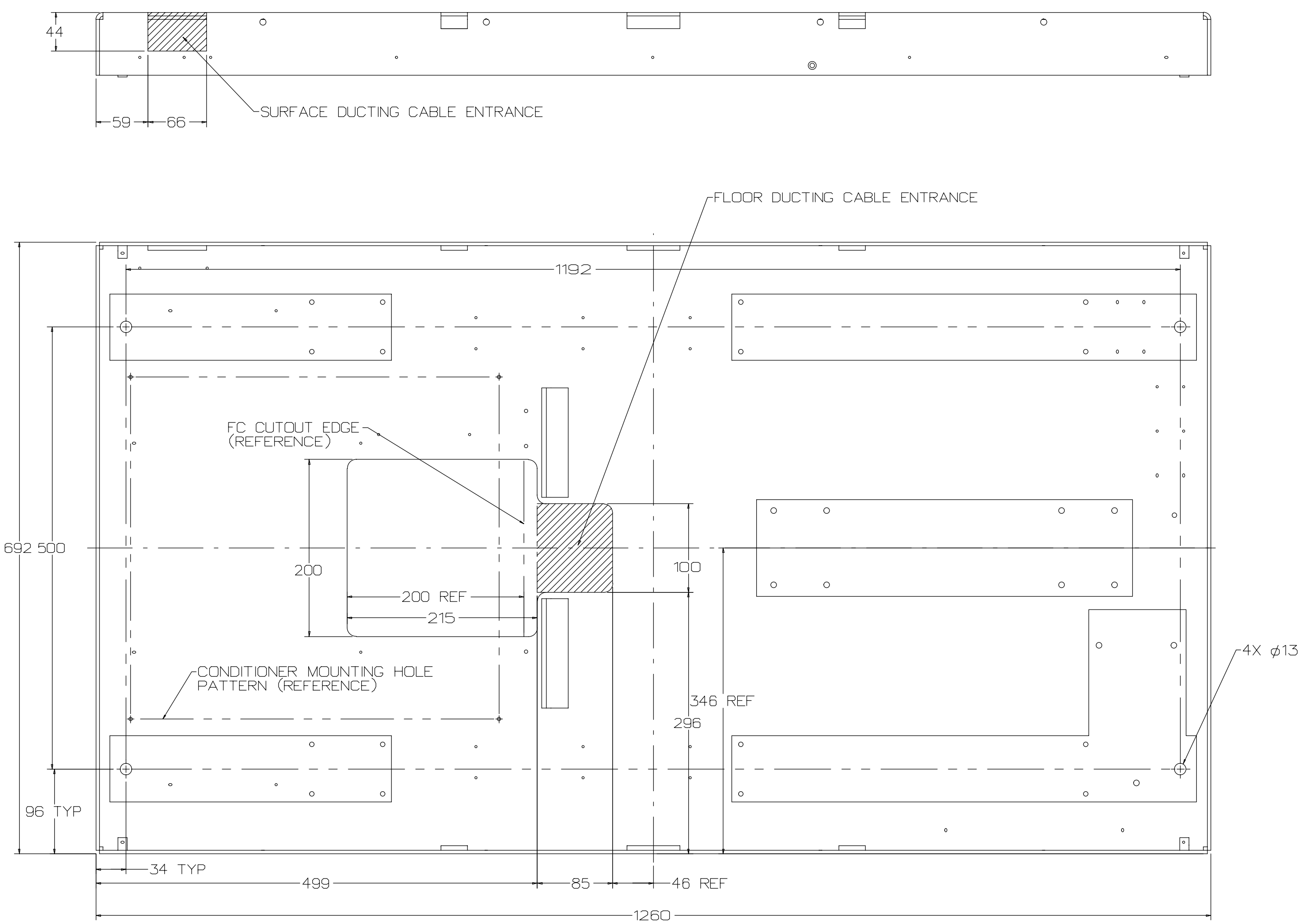
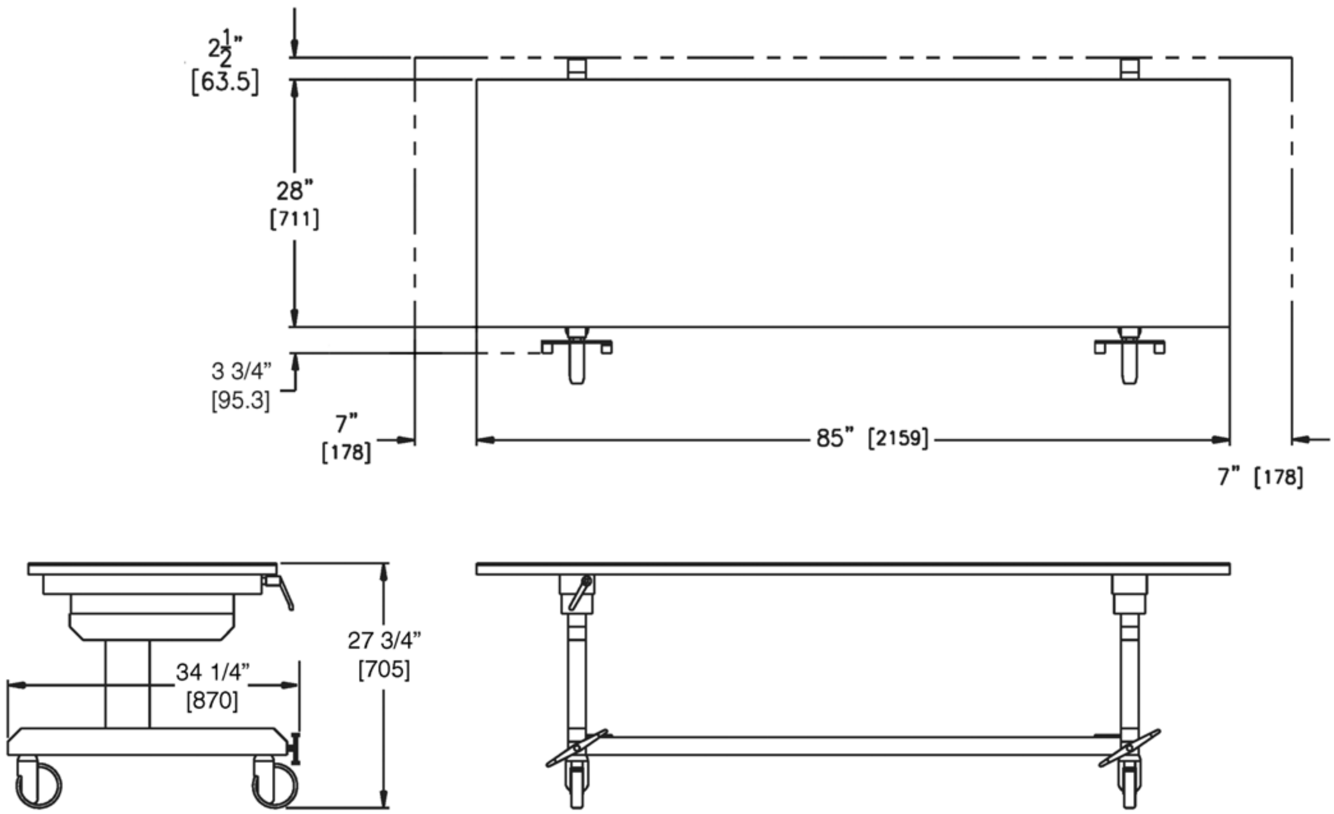


ILLUSTRATION 3–8
REVOLUTION XR/d STRETCHER (OPTIONAL)



OTS Suspension

Illustration 3–9 shows basic overall dimensions for OTS Suspensions. Illustrations 3–10 through 3–14 give layout dimensions for a typical OTS Suspension System. The equipment arrangements shown are generally preferred since they result in good utilization of equipment for the most commonly used procedures.

Table 3–4 lists major layout factors and concerns which need to be considered. Carefully check room layouts for adequate radiographic coverage, necessary clearances and provision for related equipment. Good judgement is required to avoid compromising important features. There must be ample maneuvering space allowed for the hospital cart and for personnel around the table. Also, the number of bridges on the same set of stationary rails determines overall travel capability for any one of them.

ILLUSTRATION 3–9
OTS SUSPENSION

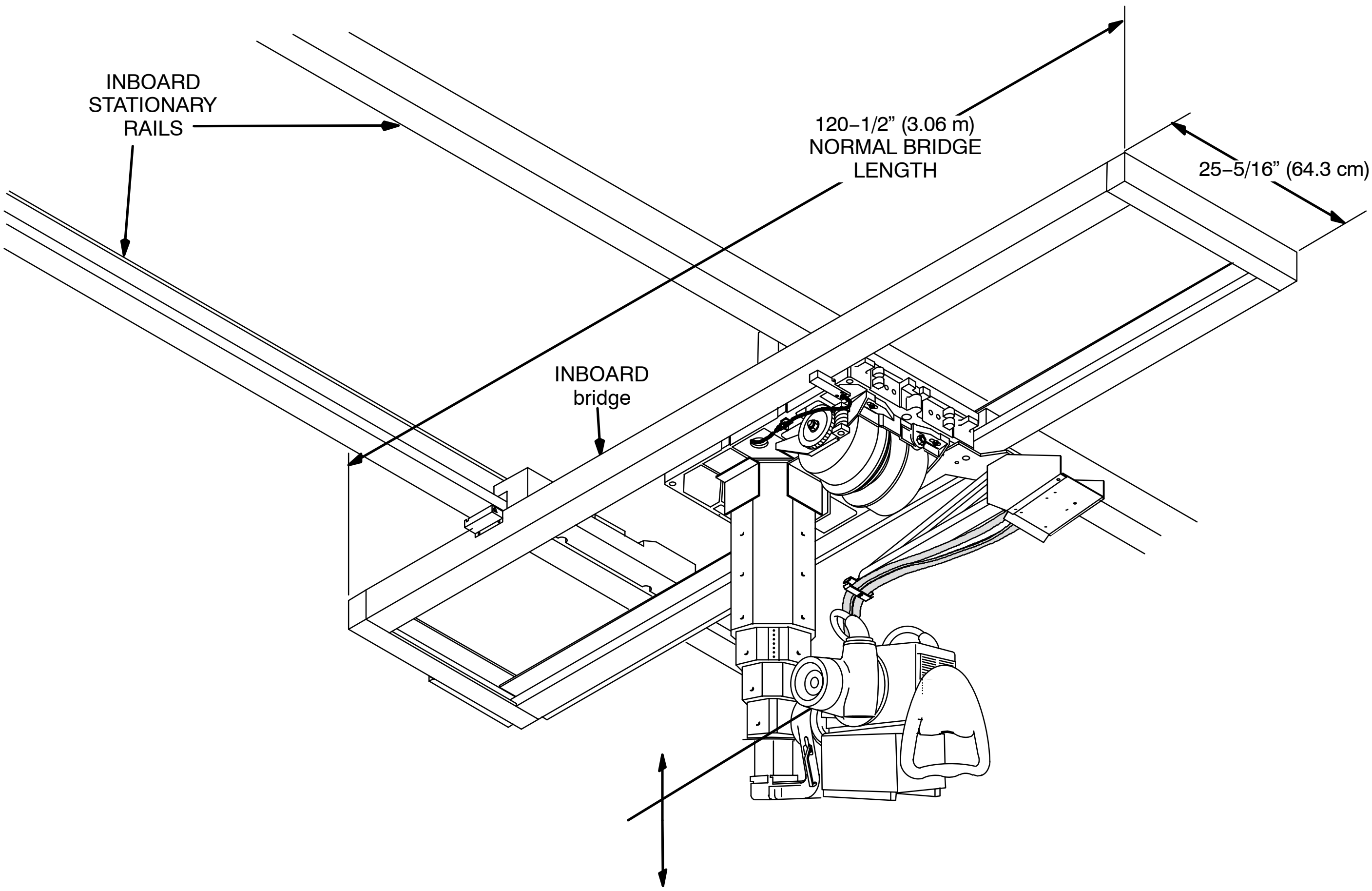


ILLUSTRATION 3–10
OTS SUSPENSION PLAN VIEW, ALL DIMENSIONS MINIMUM VALUES (2343242IDW, SHT 1, REV A)

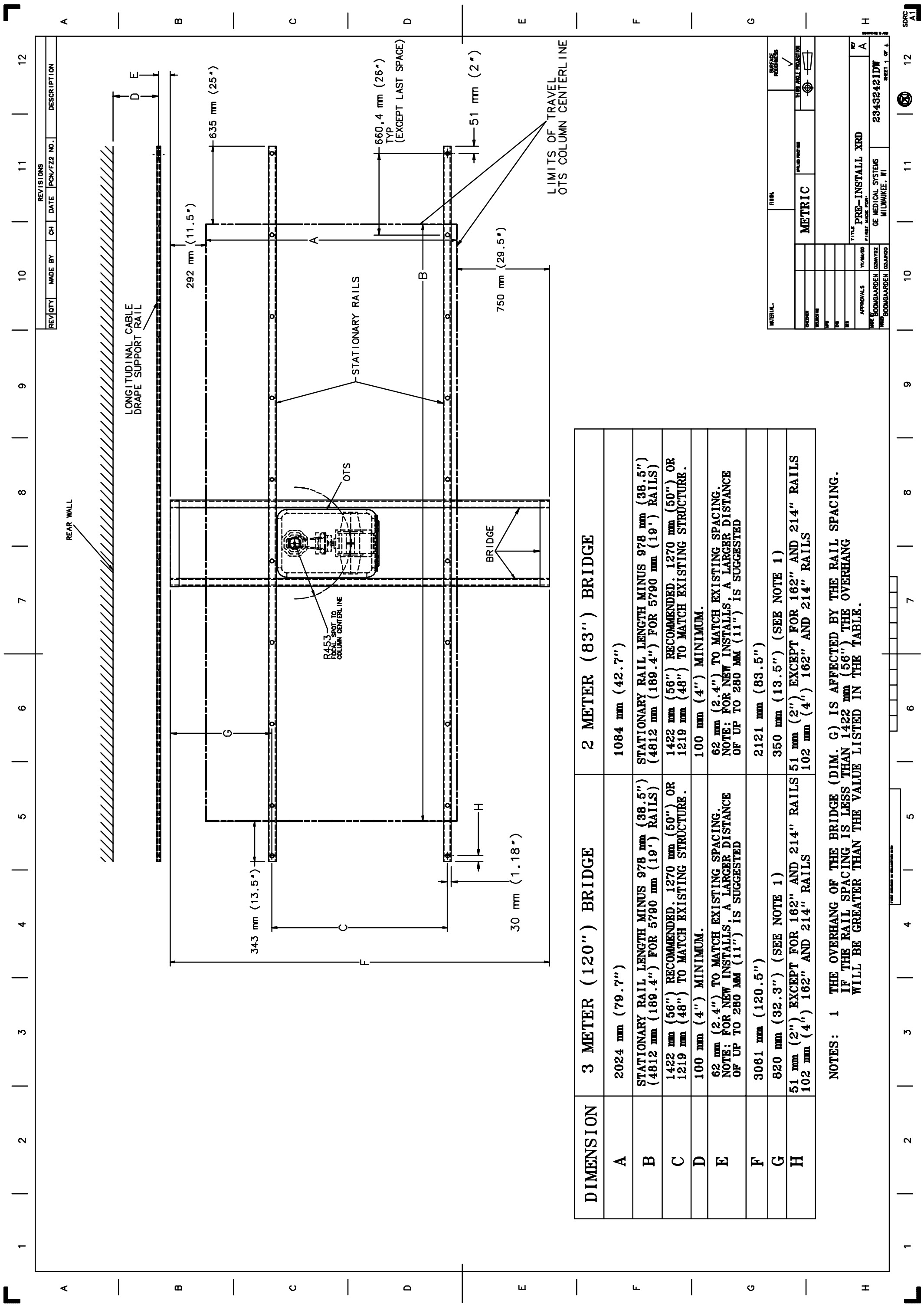
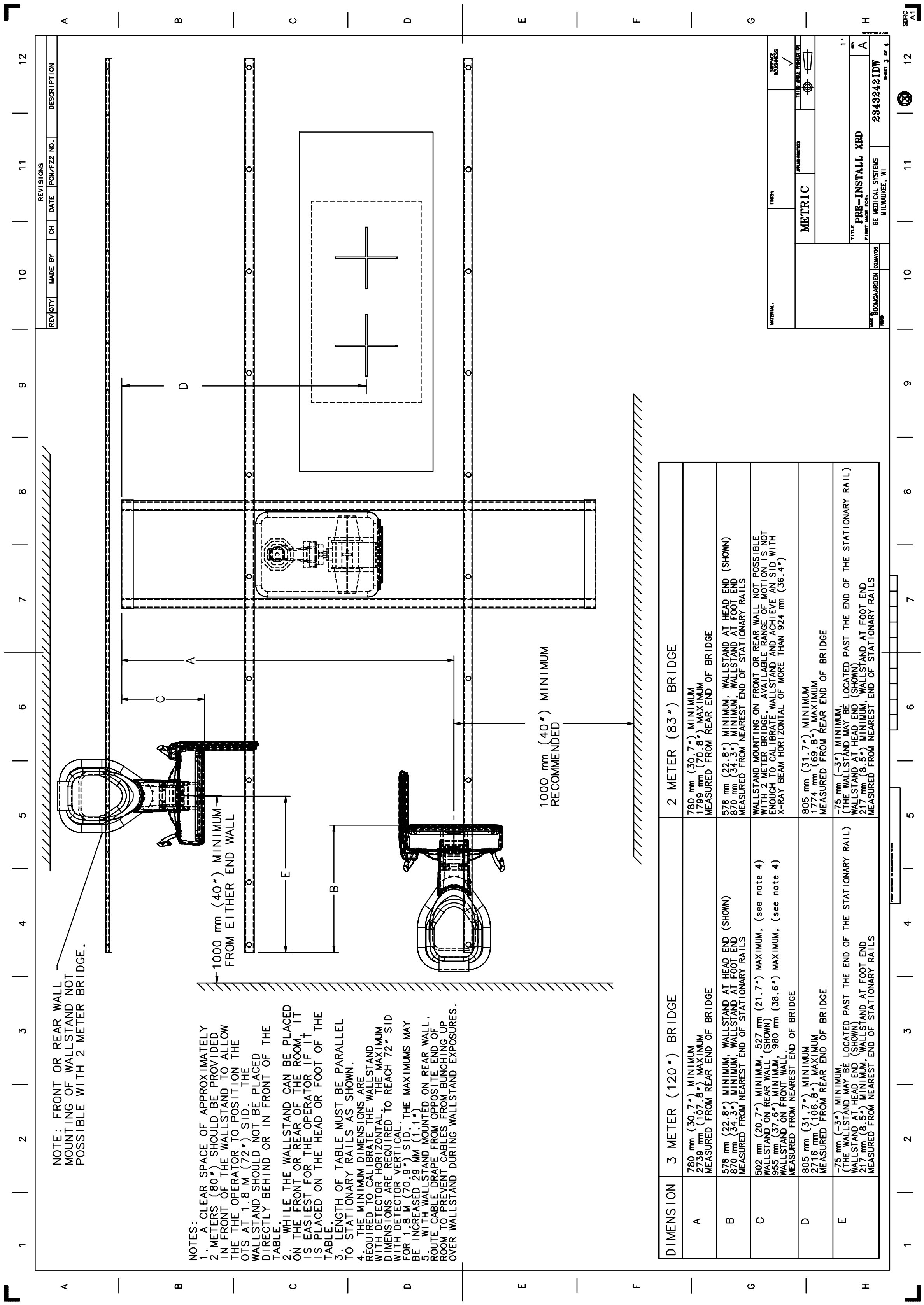


TABLE 3–4
TABLE POSITION CHART

ALL DIMENSIONS MINIMUM FOR CONDITIONS SPECIFIED		REVOLUTION?
A	44 inches SID with table vertical and cable draped.	67“ (170.2 cm)
B	36 inches Focal Spot to table centerline (cross table, rear to front).	17.25“ (43.8 cm)

ILLUSTRATION 3–11

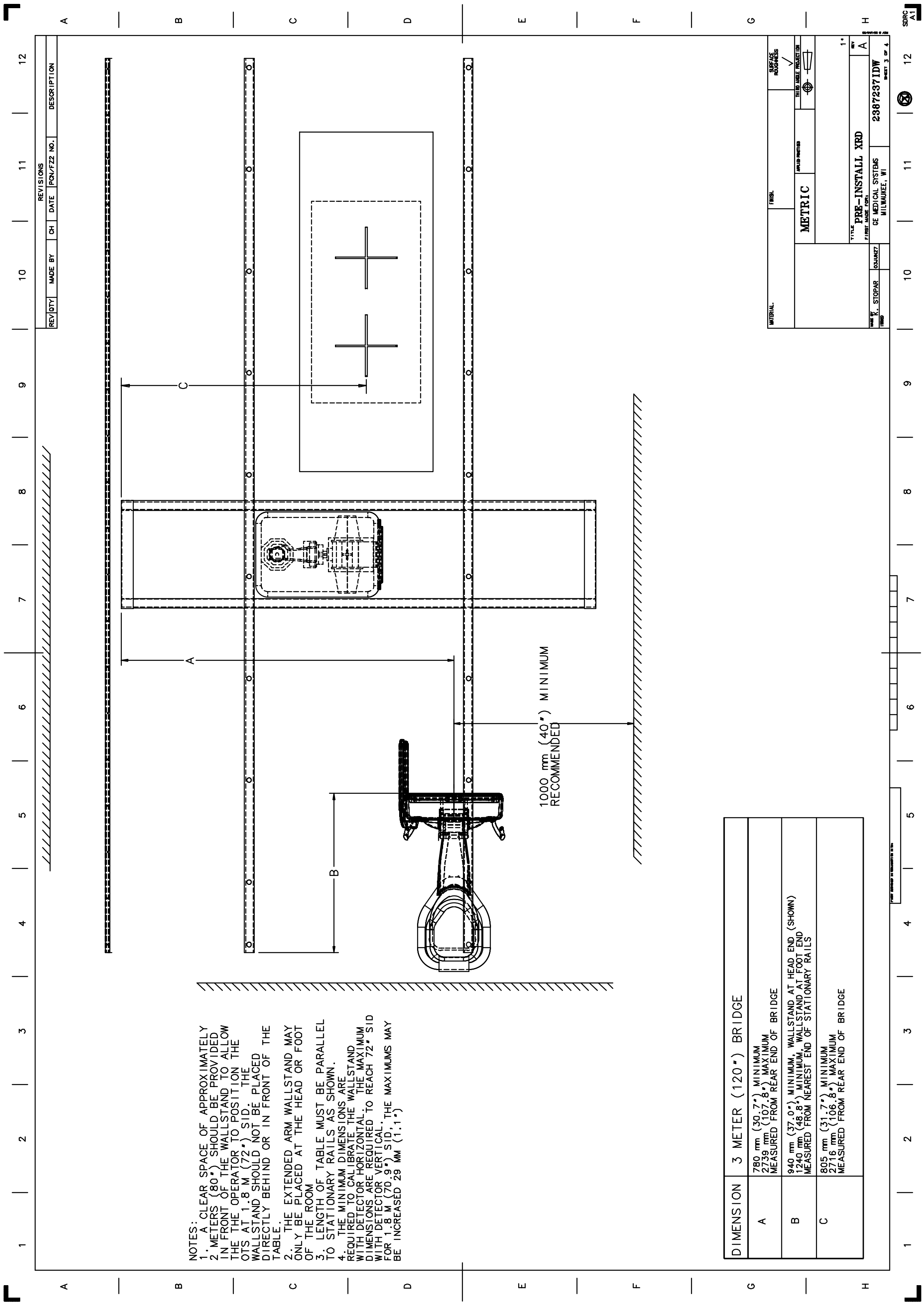
OTS BRIDGE VIEW FOR RECEPTOR STAND, ALL DIMENSIONS MINIMUM VALUES (2343242IDW, SHT 3, REV A)



DIMENSION	3 METER (120") BRIDGE	2 METER (83") BRIDGE
A	780 mm (30.7") MINIMUM 2739 mm (107.8") MAXIMUM MEASURED FROM REAR END OF BRIDGE	780 mm (30.7") MINIMUM 1799 mm (70.8") MAXIMUM MEASURED FROM REAR END OF BRIDGE
B	578 mm (22.8") MINIMUM, WALLSTAND AT HEAD END (SHOWN) 870 mm (34.3") MINIMUM, WALLSTAND AT FOOT END MEASURED FROM NEAREST END OF STATIONARY RAILS	578 mm (22.8") MINIMUM, WALLSTAND AT HEAD END (SHOWN) 870 mm (34.3") MINIMUM, WALLSTAND AT FOOT END MEASURED FROM NEAREST END OF STATIONARY RAILS
C	502 mm (20.7") MINIMUM, 527 mm (21.7") MAXIMUM, (see note 4) WALLSTAND ON REAR WALL (SHOWN) 955 mm (37.6") MINIMUM, 980 mm (38.6") MAXIMUM, (see note 4) WALLSTAND ON FRONT WALL. MEASURED FROM NEAREST END OF BRIDGE	WALLSTAND MOUNTING ON FRONT OR REAR WALL NOT POSSIBLE WITH 2 METER BRIDGE. AVAILABLE RANGE OF MOTION IS NOT ENOUGH TO CALIBRATE WALLSTAND AND ACHIEVE AN SID WITH X-RAY BEAM HORIZONTAL OF MORE THAN 924 mm (36.4")
D	805 mm (31.7") MINIMUM 2716 mm (106.8") MAXIMUM MEASURED FROM REAR END OF BRIDGE	805 mm (31.7") MINIMUM 1774 mm (69.8") MAXIMUM MEASURED FROM REAR END OF BRIDGE
E	-75 mm (-3") MINIMUM, (THE WALLSTAND MAY BE LOCATED PAST THE END OF THE STATIONARY RAIL) WALLSTAND AT HEAD END (SHOWN) 217 mm (8.5") MINIMUM, WALLSTAND AT FOOT END MEASURED FROM NEAREST END OF STATIONARY RAILS	-75 mm (-3") MINIMUM, (THE WALLSTAND MAY BE LOCATED PAST THE END OF THE STATIONARY RAIL) WALLSTAND AT HEAD END (SHOWN) 217 mm (8.5") MINIMUM, WALLSTAND AT FOOT END MEASURED FROM NEAREST END OF STATIONARY RAILS

ILLUSTRATION 3–12

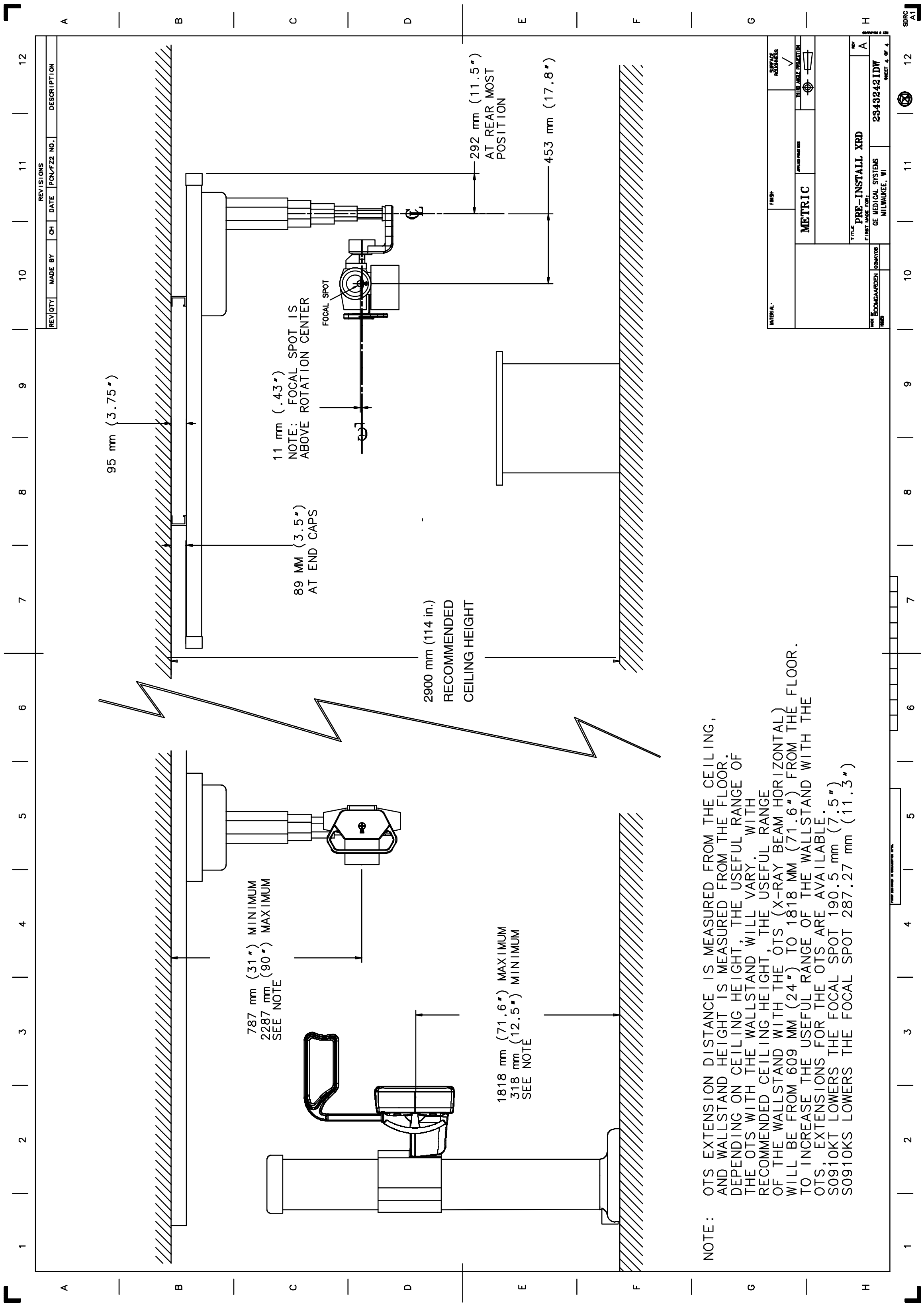
OTS BRIDGE VIEW FOR RECEPTOR STAND, ALL DIMENSIONS MINIMUM VALUES (2387237, SHT 3, REV 3)



DIMENSION	3 METER (120") BRIDGE
A	780 mm (30.7") MINIMUM 2739 mm (107.8") MAXIMUM MEASURED FROM REAR END OF BRIDGE
B	940 mm (37.0") MINIMUM, WALLSTAND AT HEAD END (SHOWN) 1240 mm (48.8") MINIMUM, WALLSTAND AT FOOT END MEASURED FROM NEAREST END OF STATIONARY RAILS
C	805 mm (31.7") MINIMUM 2716 mm (106.8") MAXIMUM MEASURED FROM REAR END OF BRIDGE

ILLUSTRATION 3–13

OTS SUSPENSION FOOT END VIEW AND WALL STAND/OTS SIDE VIEW (2343242IDW, SHT 4, REV A)



Note: Height measurements are the same for both the regular and extended wall stands.

ILLUSTRATION 3–14
OTS SUSPENSION SIDE VIEW

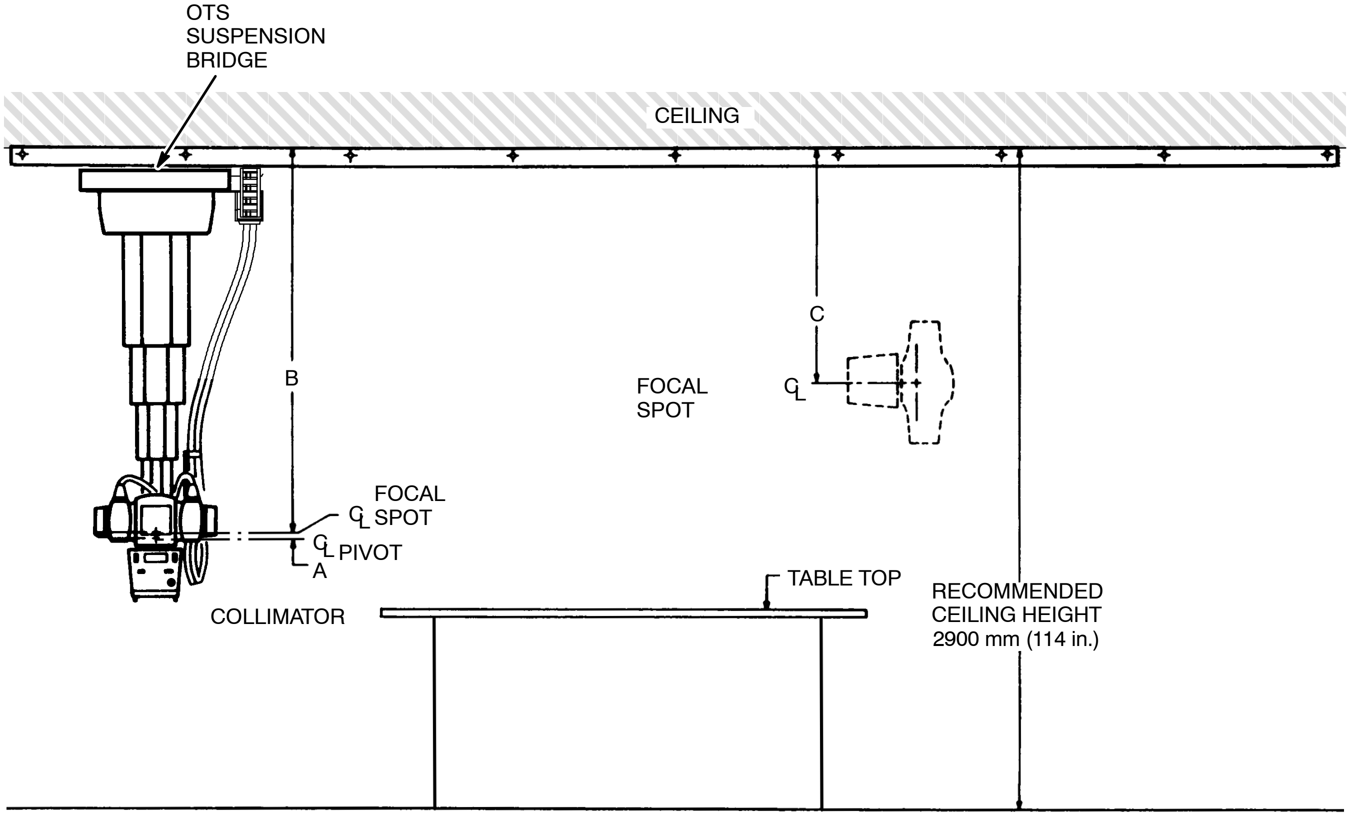


TABLE 3–5
OTS VERTICAL TRAVEL LIMITS

TRAVEL LOCATION	DIMENSIONS WITH THE MAXIRAY 100 TUBE UNIT	MIN.	MAX.
A	FOCAL SPOT ABOVE TUBE PIVOT POINT	(2.1 cm)	
B	COLLIMATOR POINTED DOWN (VERTICAL)	(71.3 cm)	(221.1 cm)
C	COLLIMATOR POINTED SIDEWAYS (HORIZONTAL)	(73.3 cm)	(223.2 cm)

ILLUSTRATION 3–15
SYSTEMS CABINET DIMENSIONS

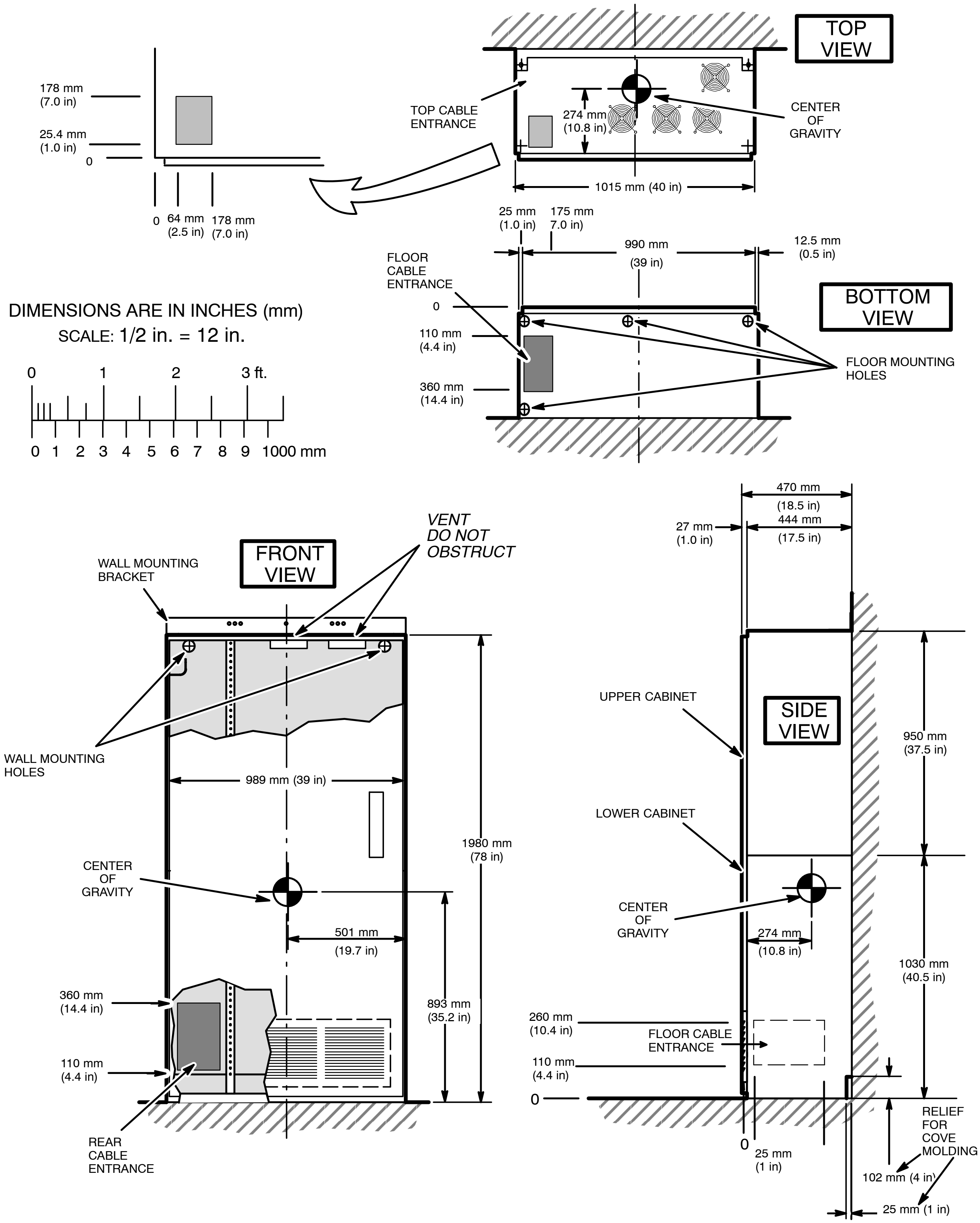


ILLUSTRATION 3–16
SYSTEMS CABINET WALL MOUNT BRACKET

WALL MOUNTING BRACKET DETAIL
(NOT TO SCALE)

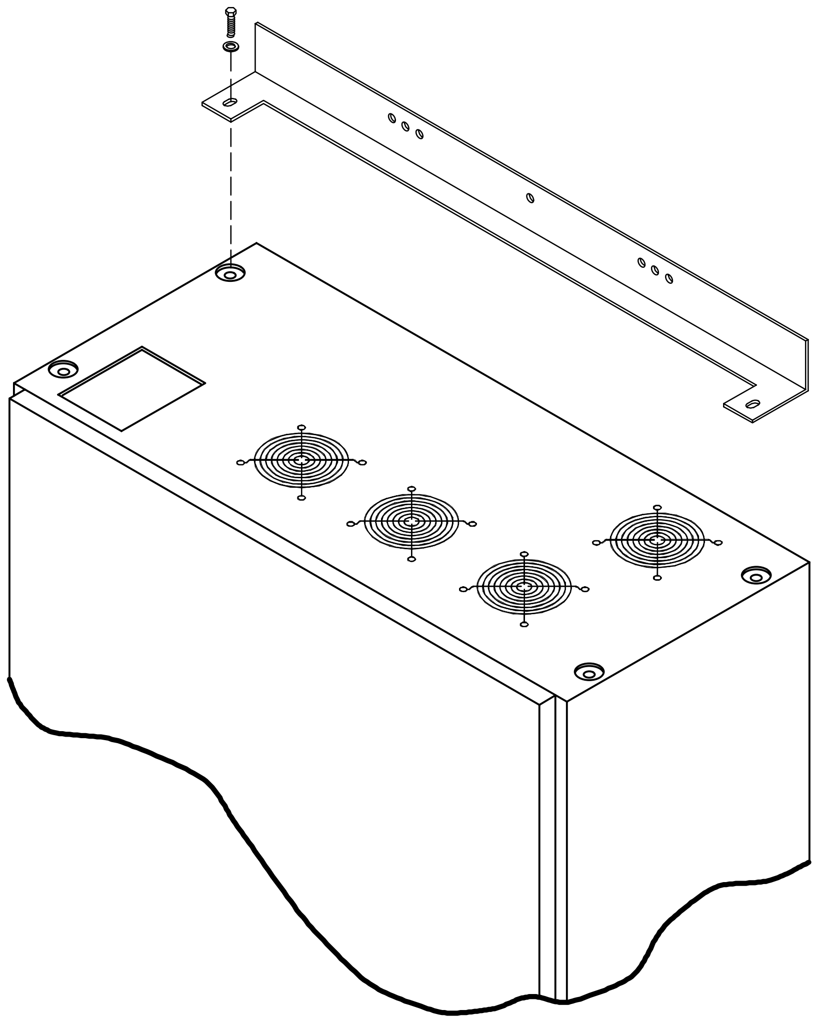


ILLUSTRATION 3–17
DETECTOR SUPPORT ASSEMBLY DIMENSIONS

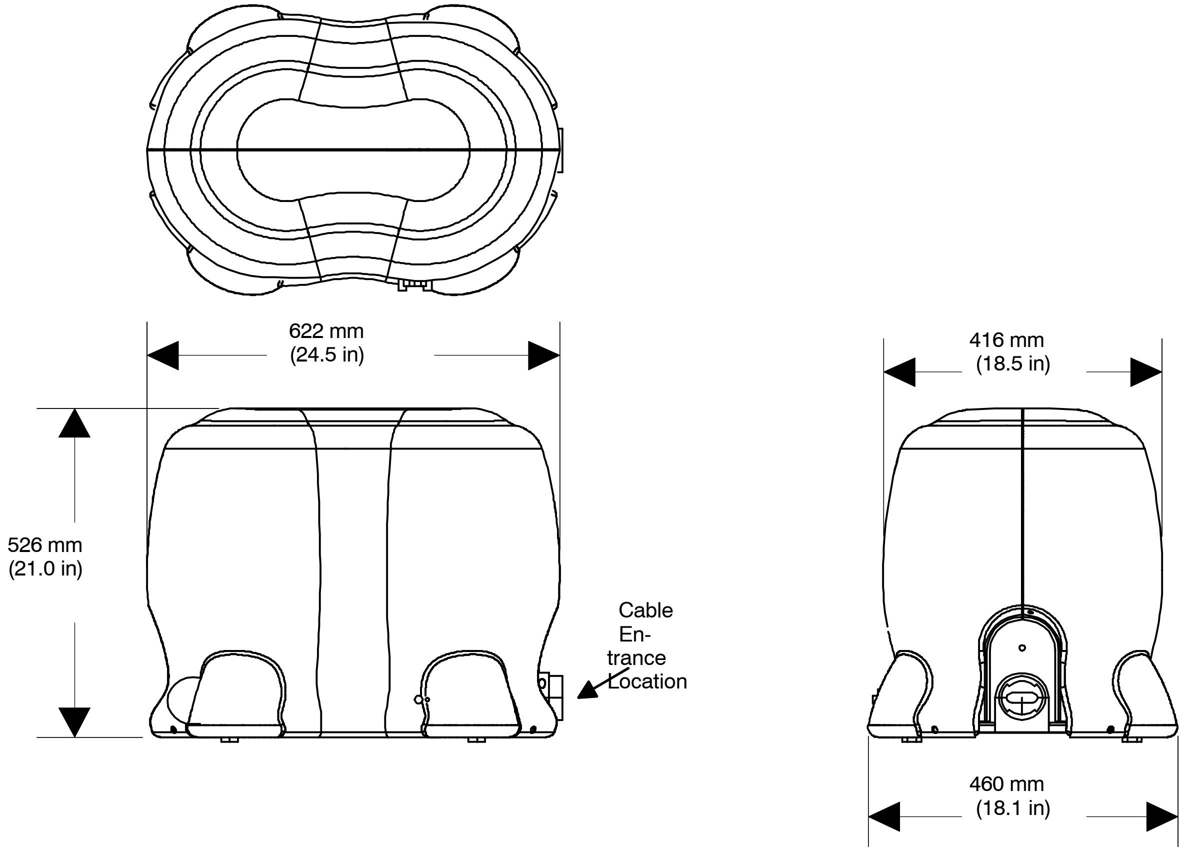


ILLUSTRATION 3–18
GRID HOLDER DIMENSIONS

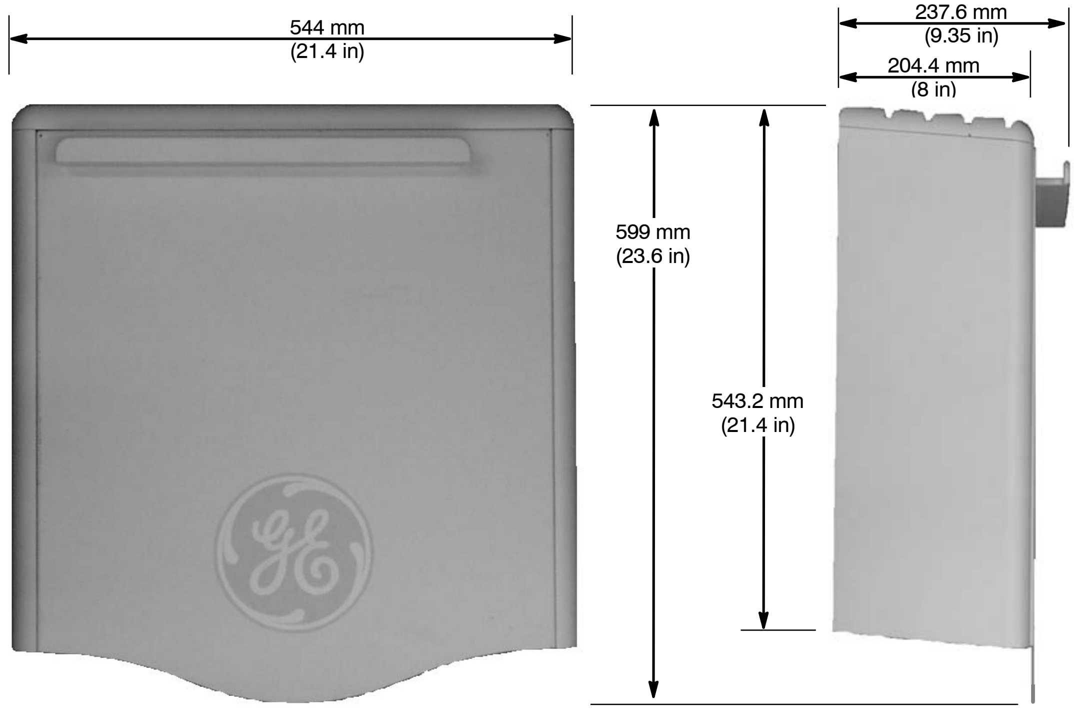


ILLUSTRATION 3–19

RECEPTOR STAND(REGULAR ARM LENGTH) DIMENSIONS (A) (2343242IDW, SHT 2, REV A)

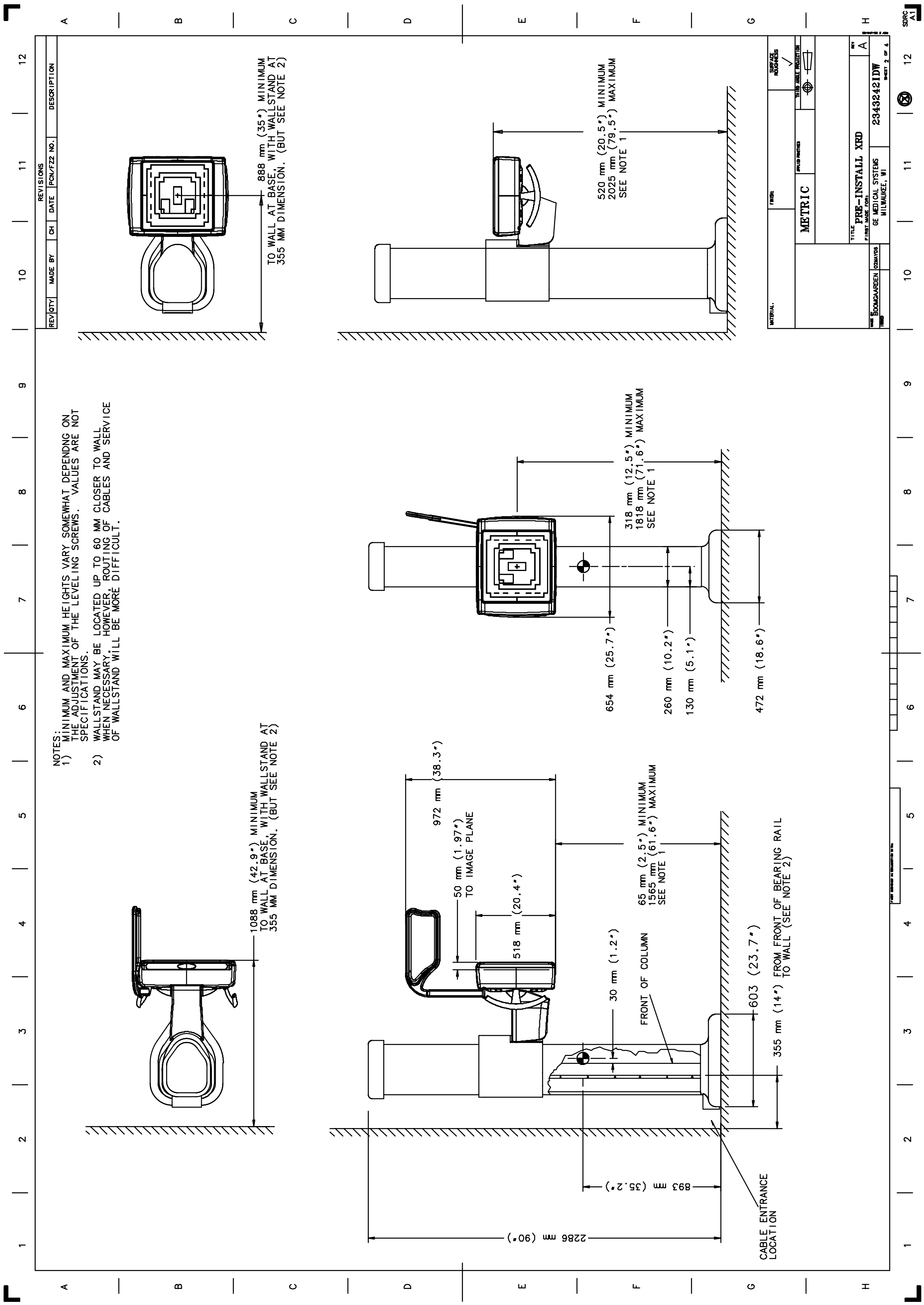


ILLUSTRATION 3–20
RECEPTOR STAND (REGULAR ARM LENGTH) DIMENSIONS (B)

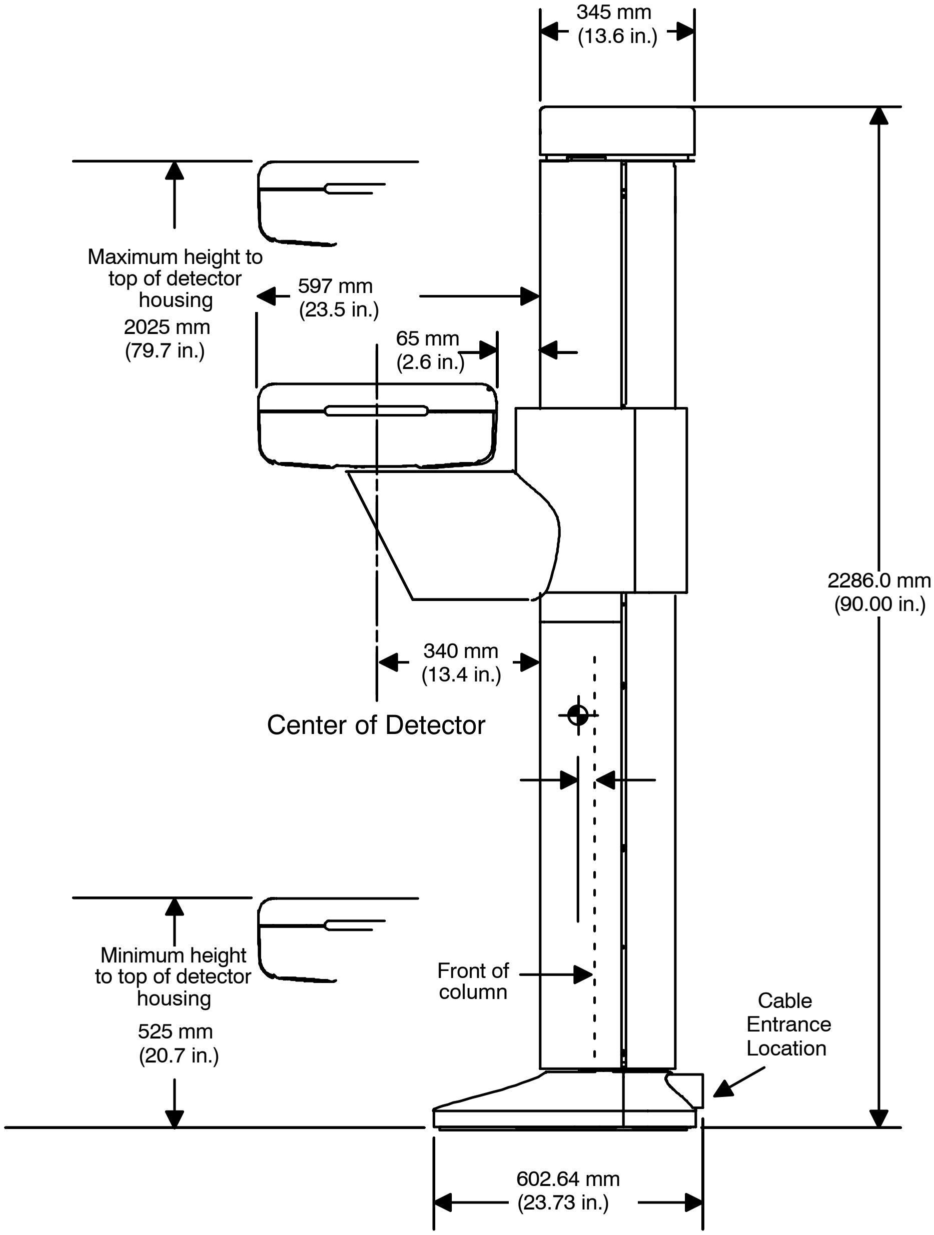


ILLUSTRATION 3–21
RECEPTOR STAND (REGULAR ARM LENGTH) AND TUBE STAND SITE IN–TRANSIT DIMENSIONS

The “In–transit” position, shown below, should be used only to move the Tube Stand and Extended Receptor Stand through low clearance areas. If the clearance height of an area is 2286.0 mm (90.0 in) or greater, then the Tube Stand and Extended Receptor Stand may be moved in the “upright” position.

Note: This drawing is not precise and is used only to show the approximate In–transit positioning for both stands.

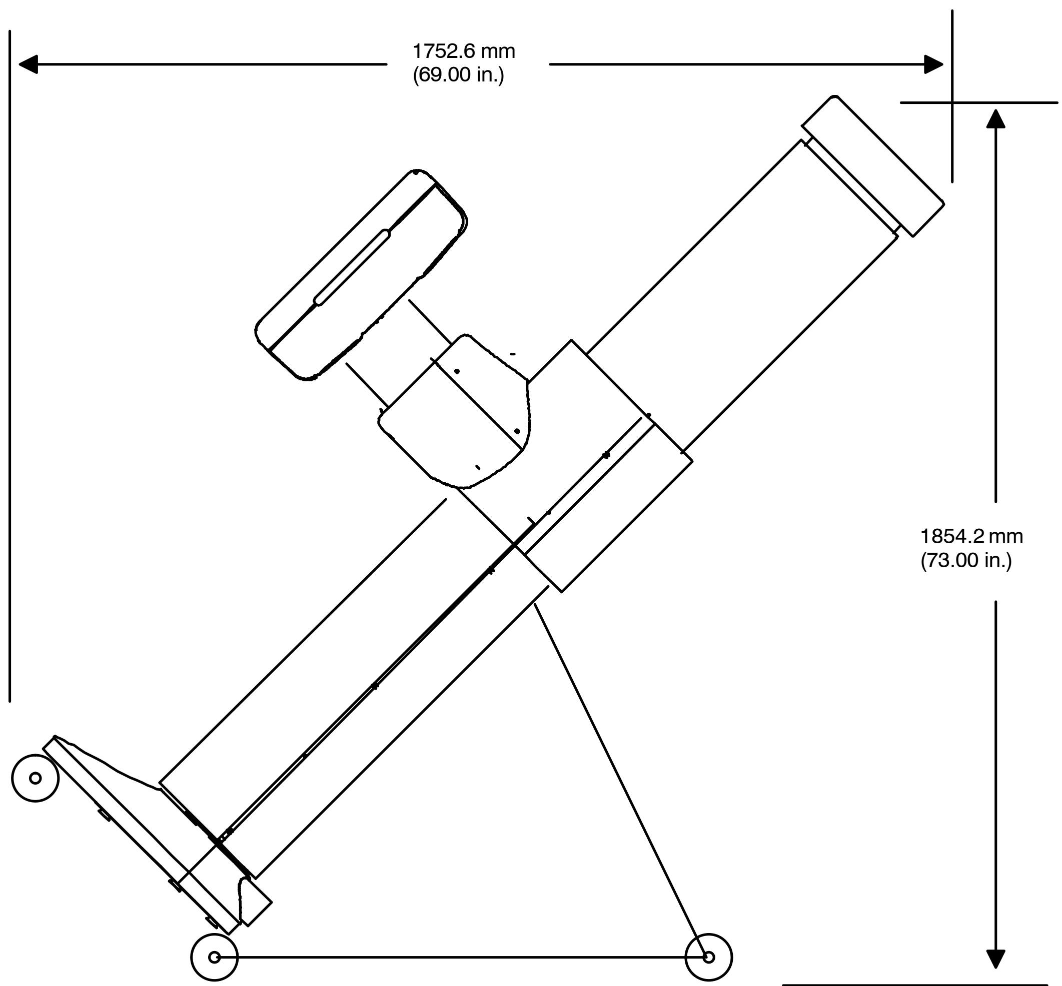


ILLUSTRATION 3–22
EXTENDED RECEPTOR STAND DIMENSIONS(A), (2387237, SHT 2, REV 2)

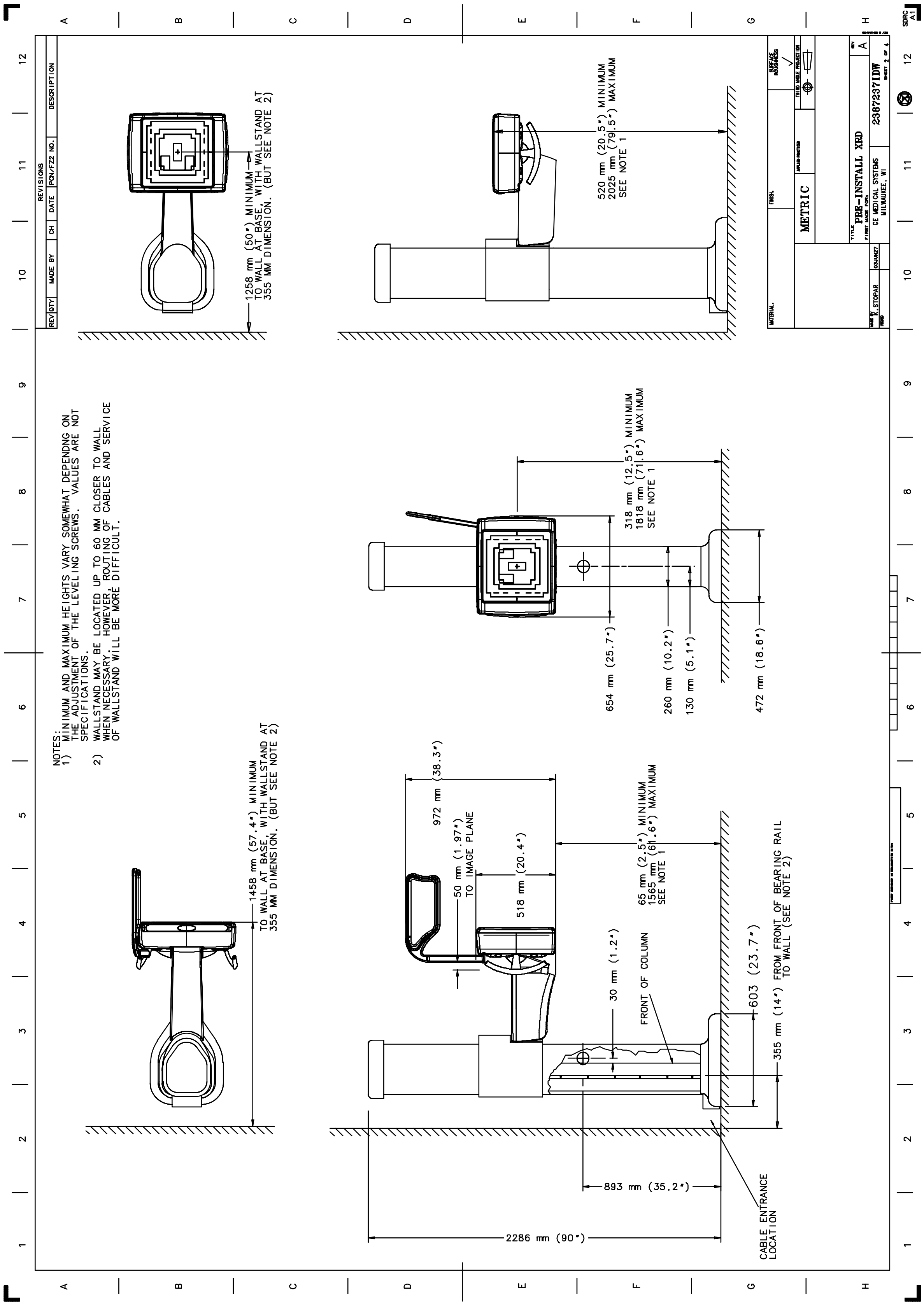


ILLUSTRATION 3–23
EXTENDED RECEPTOR STAND DIMENSIONS (B)

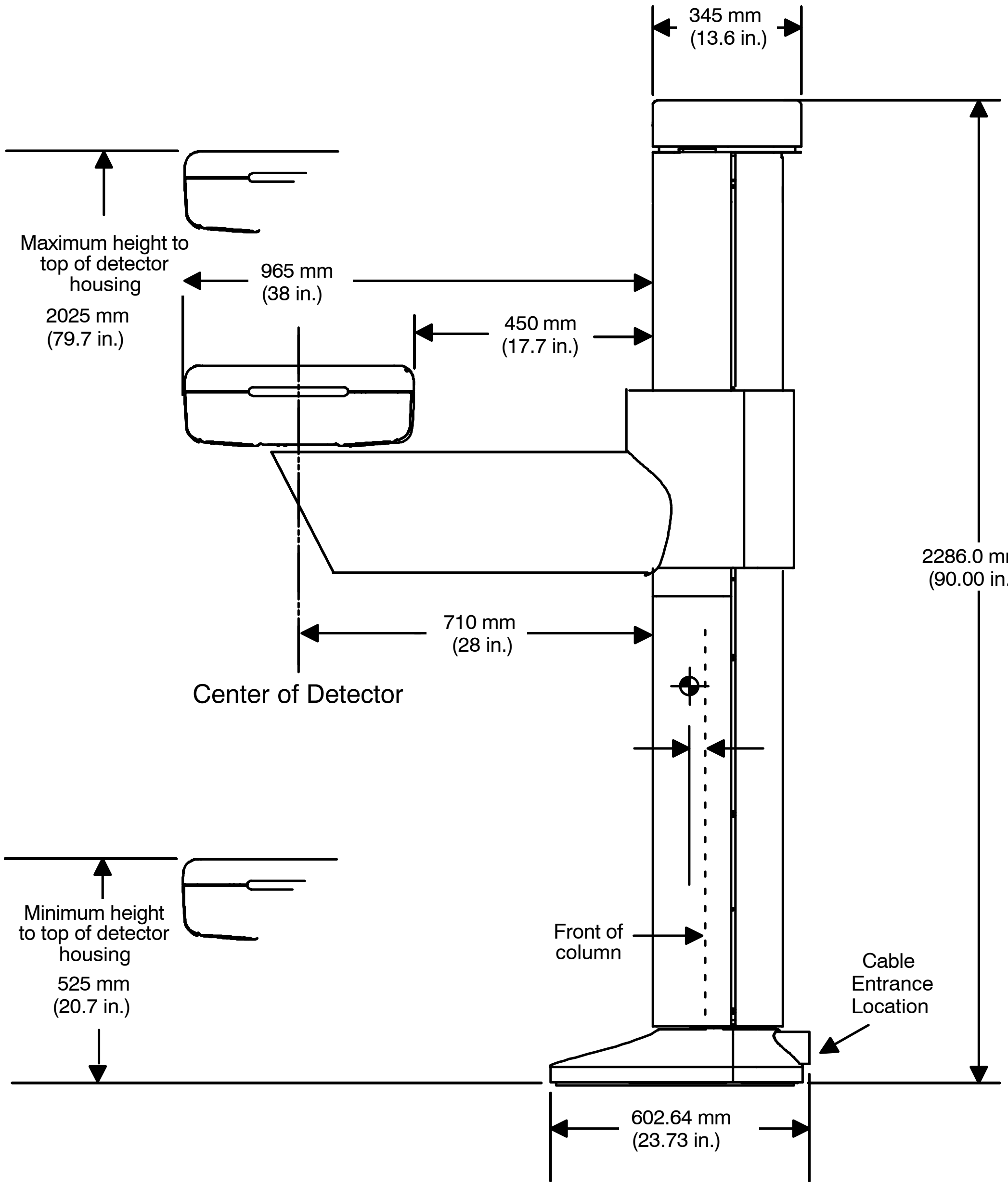
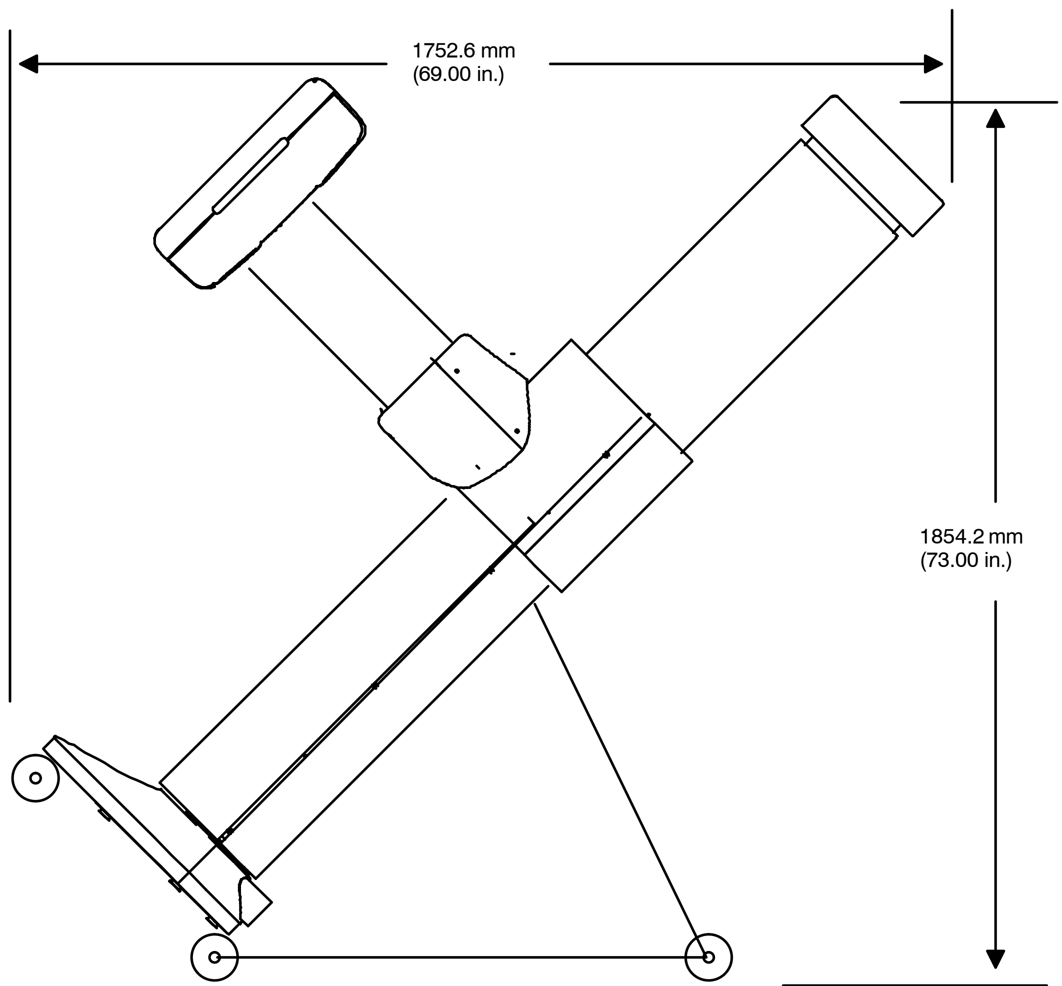


ILLUSTRATION 3–24
EXTENDED RECEPTOR STAND SITE IN–TRANSIT DIMENSIONS

The "In–transit" position that is shown below should be used only to move the Tube Stand and Extended Receptor Stand through low clearance areas. If the clearance height of an area is 2286.0 mm (90.0 in) or greater, then the Tube Stand and Extended Receptor Stand may be moved in their "upright" positions.

Note: This drawing is not precise and is used only to show the approximate In–transit positioning for both stands.



3-3 Room Layout

3-3-1 Radiation Production

Because X–ray equipment produces radiation, you may need to take special precautions or make special site modifications. The General Electric Company does not make recommendations regarding radiation protection. It is the purchasers responsibility to consult a radiation physicist for advisement on radiation protection in X–ray rooms.

3-3-2 Service Access

Allow appropriate space for service access of equipment. Consult component pre–installation directions for clearance information.

3-3-3 Clinical Access

Make sure that you plan the room with the following clinical access requirements:

- Provide easy access to the patient table. Stretchers and other mobile hospital equipment must reach the table quickly.
- Table cannot be installed at 90 degrees to the ceiling rails.
- Clinicians at the patient table must be able to communicate with assistants in the control area.
- Operators in the control area must have easy access to the control console. However, position the controls (including handswitches) so the operator cannot take exposures while looking around or standing outside the control booth's lead glass window.
- Consult customer on the number and location of nonelectrical lines (air, oxygen, vacuum, water, etc.) in the radiographic room.
- Provide easy access to the wallstand.
- Ensure there is enough space between the table and the wallstand to perform standing ankles, knees, etc.
- For both the extended and the regular wallstands, ensure that the room layout is such that the tube can be centered on top of the horizontal detector.
- 3m bridge must be used with the installation of the extended wallstand.
- When installing an extended wallstand, the wallstand should be positioned directly in the center of the 3m bridge if full tube angling capabilities are to be achieved.
- When installing an extended wallstand, it may only be located in the head– or foot–position of the room.
- For the extended wallstand, the gooseneck may only be used in the 0 degree and 90 degree positions.

Note: The generally accepted practice is to load the patient laterally. In case of room layout designed for longitudinal patient loading, some modifications must be brought to the table.

3-3-4 Peripheral Equipment

Consult hospital personnel regarding additional space requirements for the following types of hospital equipment:

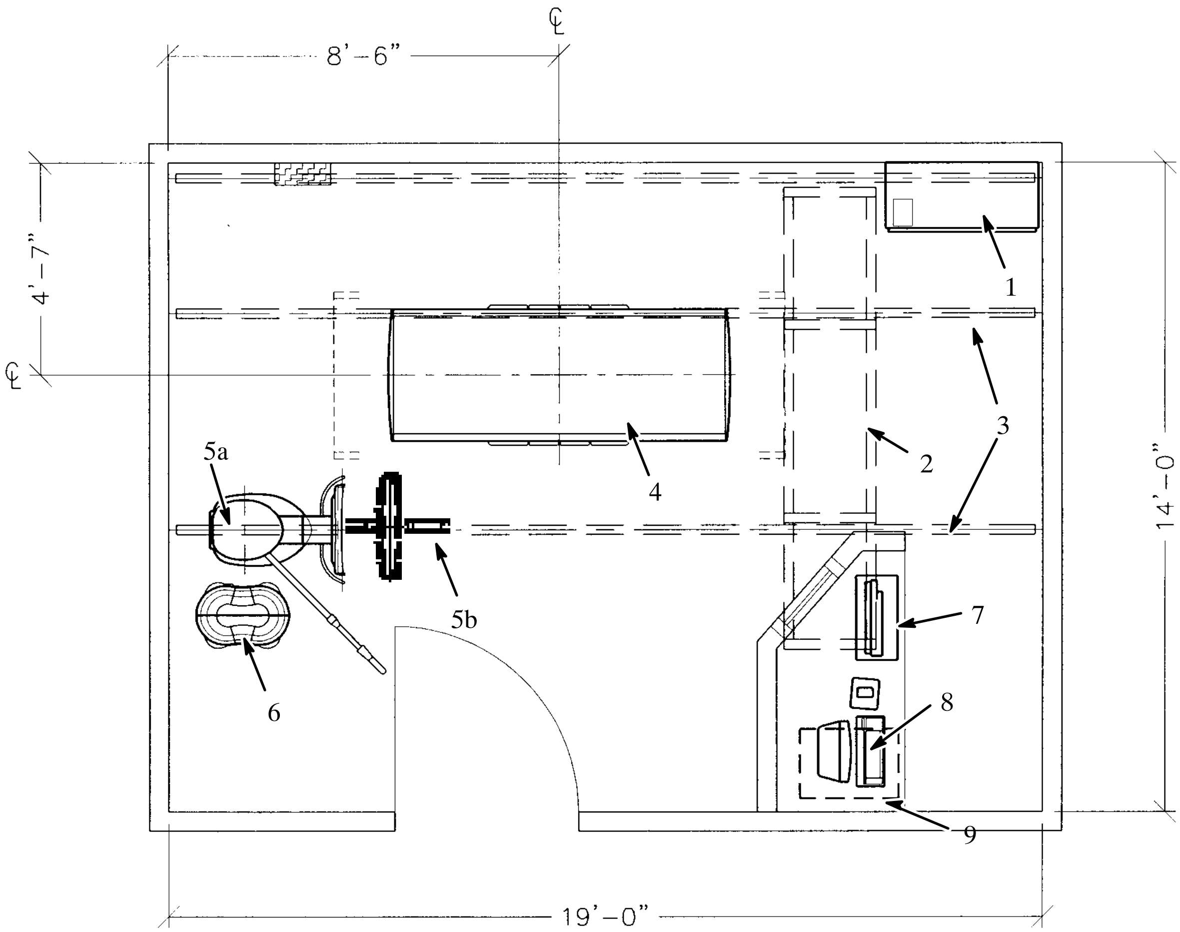
- storage cabinets
- sinks
- oxygen stations
- injectors
- heart monitoring equipment
- crash cart

3-4 Room Layout Drawings

See Illustrations 3–25 (page 48) thru 3–29 (page 52), for typical Revolution XR/d system room layouts.

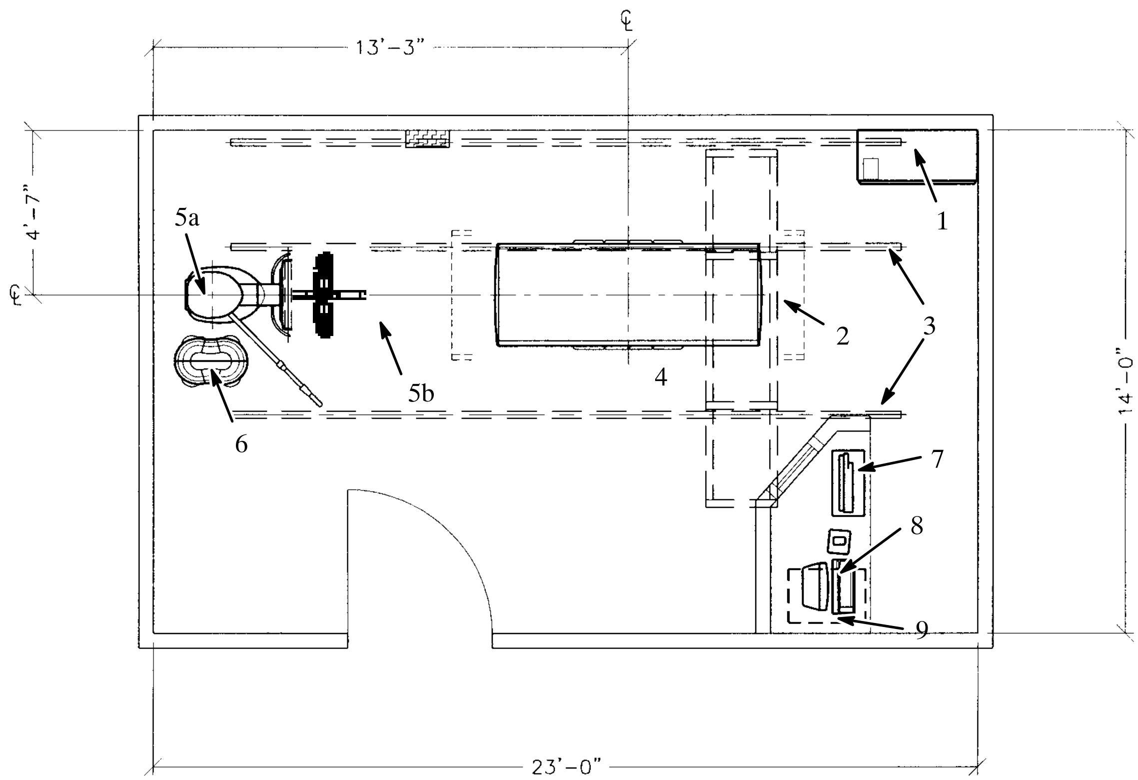
Note: You will notice that a minimum of 2200 mm of clearance shown, from the table frame to either end of the table, to allow the table top to be installed.

ILLUSTRATION 3–25
TYPICAL ROOM LAYOUT WITH TABLE AND RECEPTOR STAND OFFSET FROM TABLE CENTER LINE



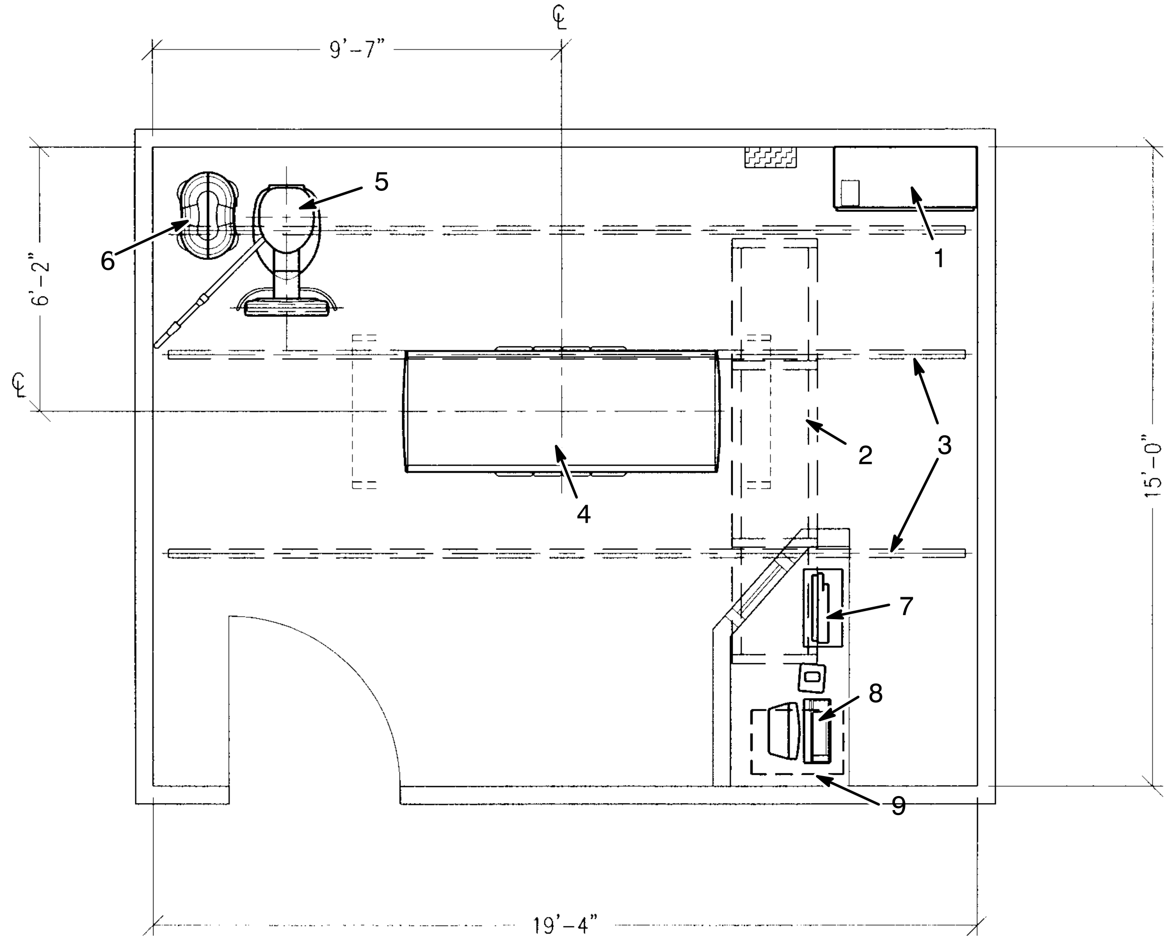
1. SCPU Generator
2. OTS
3. Longitudinal Stationary Rails
4. Revolution XR/d Table
5a. Revolution Digital Chest Stand
5b. Revolution Digital Extended Wall Stand
6. DSA
7. Advantx Console
8. ADS Monitor and Keyboard
9. ADS Enclosure

ILLUSTRATION 3–26
TYPICAL ROOM LAYOUT WITH TABLE AND RECEPTOR STAND INLINE WITH TABLE CENTER LINE



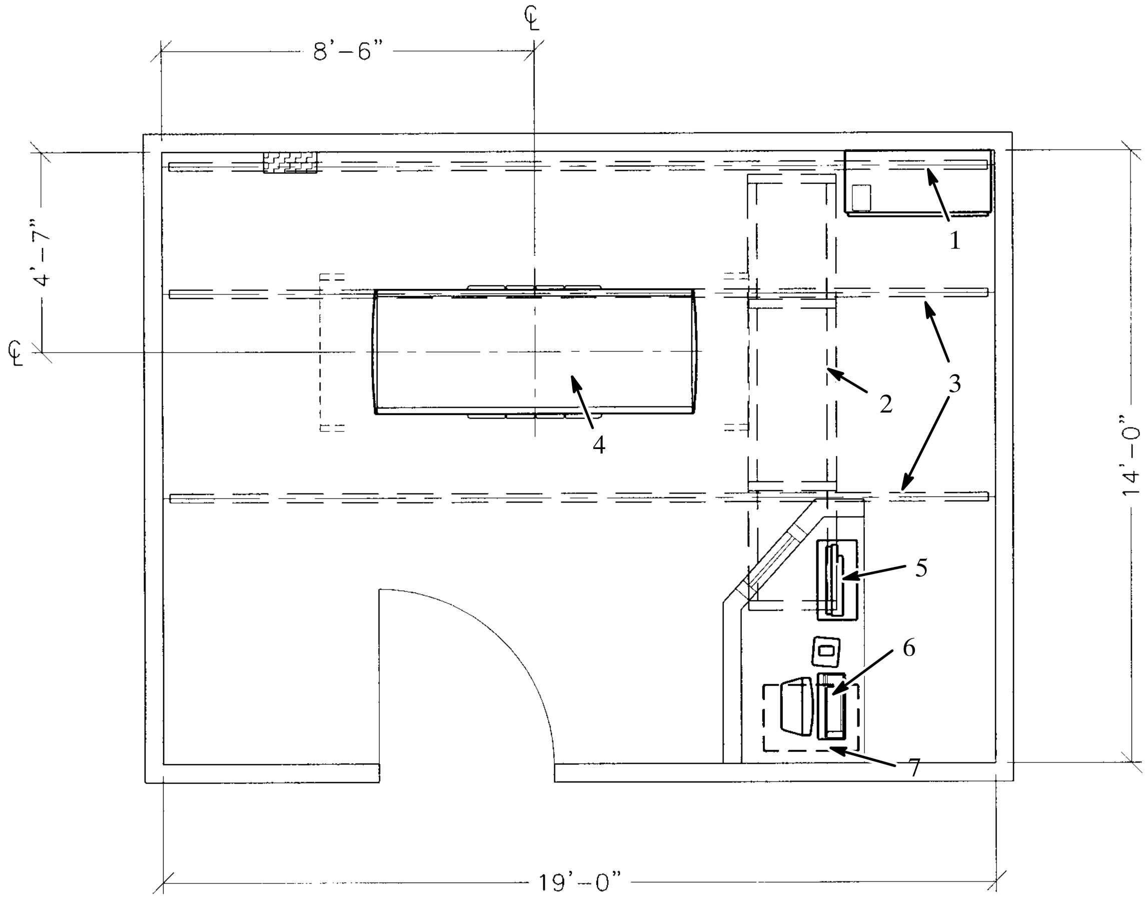
1. SCPU Generator
2. OTS
3. Longitudinal Stationary Rails
4. Revolution XR/d Table
5a. Revolution Digital Wall Stand
5b. Revolution Digital Extended Wall Stand
6. DSA
7. Advantx Console
8. ADS Monitor and Keyboard
9. ADS Enclosure

ILLUSTRATION 3−27
TYPICAL ROOM LAYOUT WITH TABLE AND RECEPTOR STAND PERPENDICULAR TO TABLE CENTER LINE (cannot be used with Extended Wall Stand)



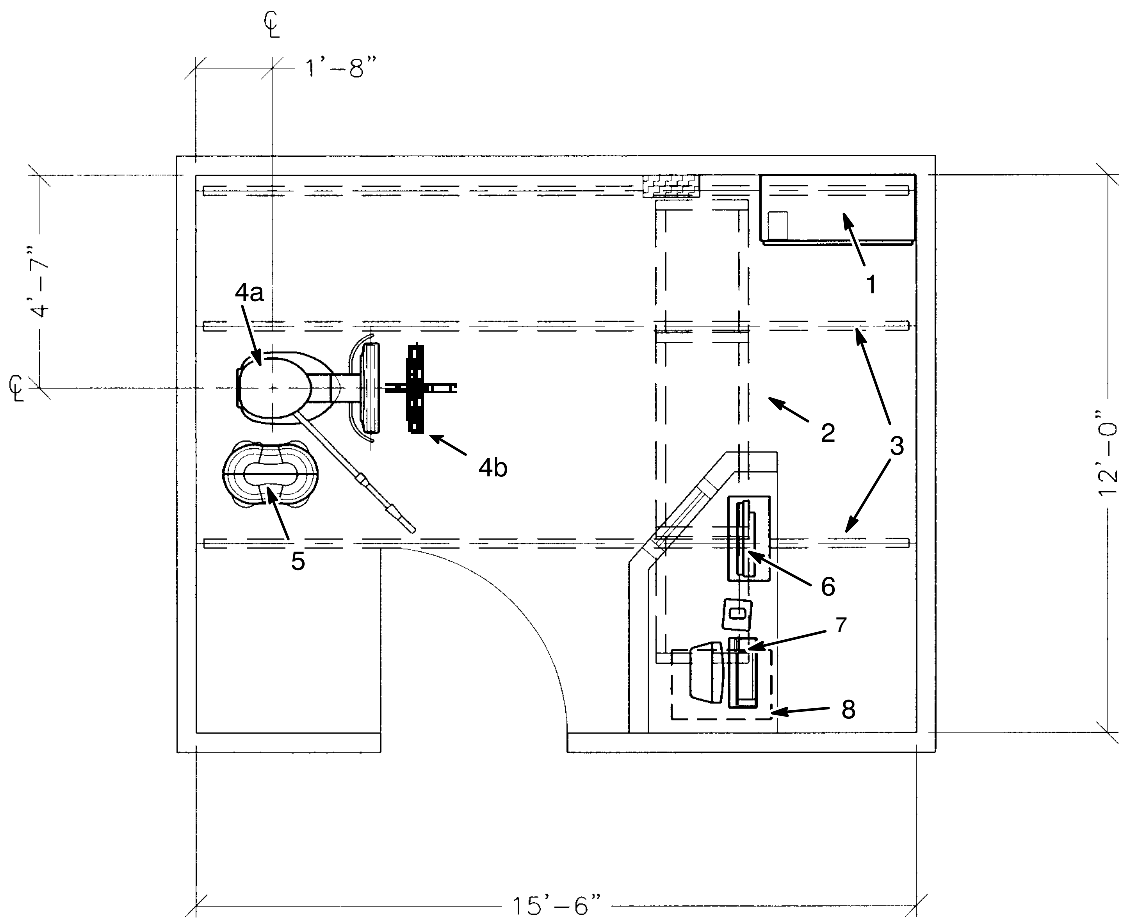
1. SCPU Generator
2. OTS
3. Longitudinal Stationary Rails
4. Revolution XR/d Table
5. Revolution Digital Wall Stand
6. DSA
7. Advantx Console
8. ADS Monitor and Keyboard
9. ADS Enclosure

ILLUSTRATION 3–28
TYPICAL ROOM LAYOUT WITH TABLE ONLY



1. SCPU Generator
2. OTS
3. Longitudinal Stationary Rails
4. Revolution XR/d Table
5. Advantx Console
6. ADS Monitor and Keyboard
7. ADS Enclosure

ILLUSTRATION 3–29
TYPICAL ROOM LAYOUT WITH RECEPTOR STAND ONLY



1. SCPU Generator
2. OTS
3. Longitudinal Stationary Rails
4a. Revolution Digital Chest Stand
4b. Revolution Digital Extended Wall Stand
5. DSA
6. Advantx Console
7. ADS Monitor and Keyboard
8. ADS Enclosure

TABLE 3–6
RECOMMENDED AND MINIMUM ROOM ROOM HEIGHT

	CEILING
Recommended	2900 mm (114 in.)
Minimum	2745 mm (108 in.)

TABLE 3–7
OTS SUSPENSION LAYOUT FACTORS

FACTORS TO BE CONSIDERED	PERTINENT INFORMATION
Vertical operating range of OTS Suspension.	Generally, a 9'–6" (2.9 m) stationary rail height Is recommended. At 9'–6" (2.9 m) The OTS Suspension has these vertical limits (with Maxiray 100 tube unit): Max. Source–to–Image Distance – 85–15/16" (2.18 m) Min. Source–to–Image Distance – 26–15/16" (68.4 cm)
Distance between center lines of ceiling mounting bolt holes in stationary rails. The recommended spacing is 56 inches (1.43 meters) and should be used with all new structures. Holes have been drilled in the bridge rails to accommodate 48 inch (1.22 meter) and 50 inch (1.27 meter) spacing distances resulting from an existing structure.	56" (1.43m), or 50" (1.27m), or 48" (1.22m) Adjustment is provided to permit a +/– 1/4" (+/– 6 mm) variation of this span; however, this tolerance does not have anything to do with degree of parallelism of the stationary rails, which must be held to +/–1/8" (+/– 3 mm)
Minimum overall room dimension, front–to–back, without modifying basic structure.	124–1/4" (3.2 m)
The recommended focal spot to table centerline distance for cross table radiography, rear to front, is 36 inches (91.4 cm)	50" (1.27 m) minimum required from longitudinal center line of table to center line of support rail for cable drape or concealment.
When using 3–1/2" x 3–1/2" (8.9 cm x 8.9 cm) posts (Cat. #B2054FH) and structural steel channel to support stationary rail.	Allow for width of channel between wall and stationary rail. Overall length must included stationary rail length plus columns at each end. Minimum recommended channel size is 2" x 8" x 11.5 Lb/Ft. (5.1 cm x 20.3 cm x 17.1 Kg/m).
Clearance for longitudinal shift top excursion. Allow clearance for cart work at head end of the table.	Preferably, there should be walking space between the end of the extended table top and any obstruction.
Clearance at end of stationary rail for RAD tube unit 90 degrees from front.	14" (35.6 cm) Clearance required between end of stationary rail and side wall. (Requirements decrease if cable covers are used).
Number of bridges on the same set of stationary rails.	Each bridge adds 25–1/2" (64.8 cm) to the overall length requirement. Also, each bumper used between these bridges will add 1" (25 mm).
Heat from overhead spotlights.	Caution should be taken to avoid excessive heat form overhead spotlights. Damage can occur to ceiling–mounted components and wiring if high wattage bulbs are used. Recommend low wattage bulbs no higher than 75 watts and use dimmer controls. Do not mount lights directly above areas where ceiling mounted accessories will be parked.

3-5 Cable Channeling

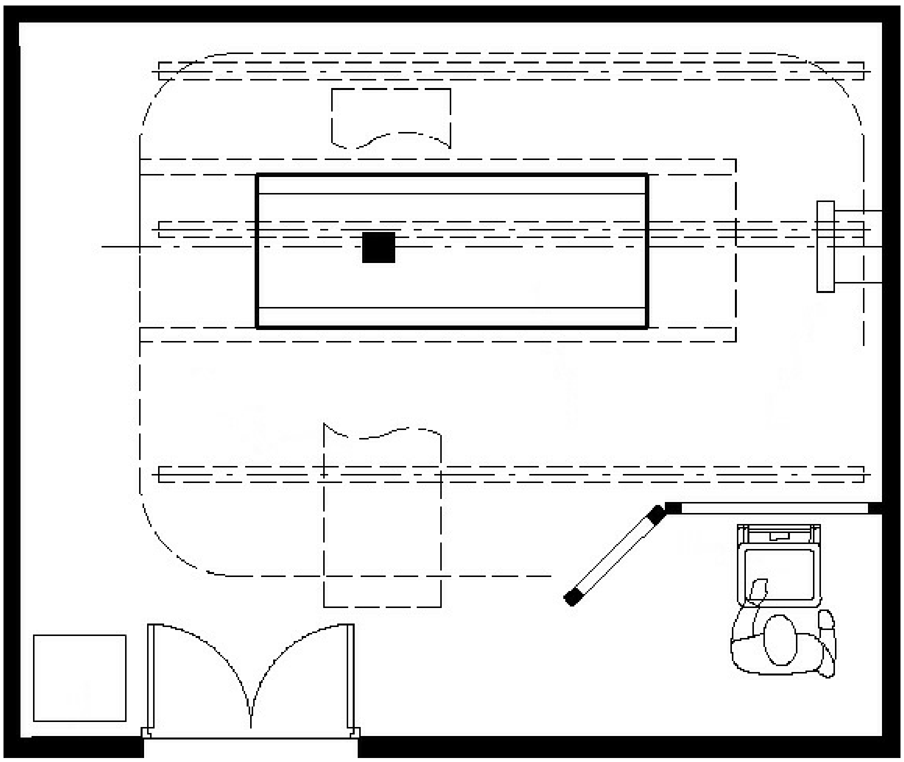
3-5-1 Conduit

Conduit has some important restrictions when used with modularized X–ray systems. The primary consideration is that the majority of cables used are preterminated, which greatly simplifies interconnection, but makes cable–pulling difficult because of the added dimensions of the connectors. Conduit must be large enough to pass the cable and connector through with all other cables already in the conduit. Also consider the possibility of additional cables being added as the system is developed.

The use of conduit is recommended for cables running overhead between rooms, especially when a diagonal run provides the shortest cable path.

3-5-2 Floor Duct

Floor duct has advantages when use with a single room or two adjacent rooms. Floor duct combines a neat, functional appearance with accessibility and room for expansion. The disadvantage is the amount of work required to install it, which is generally prohibitive in old installations. For the same reason, it is impractical to attempt to add on to existing floor duct systems.



3-5-3 Raceway

Raceway is very practical to use in existing structures, since it is surface–mounted. There is no problem with preterminated cables, since the entire raceway system can be opened. Raceway systems are relatively easy to expand, as compared to other means of routing cables. Equipment cabinets have been designed for extensive interfacing with raceway.

PREPARATIONS REQUIRED IN ADVANCE OF EQUIPMENT DELIVERY

- Familiarization with site room dimensions.
- Room lighting, floor finish, and ceiling and wall painting.
- Installation of power supply when table is not powered by the generator.
- Installation of junction boxes of proper size including covers and fittings at locations required per current installation plan.
- Installation and labeling of a disconnect switch.
- Equipment delivery route checked to ensure delivery without door removal.

3-6 Tools And Test Equipment

In addition to the standard service tools, this section provides a summary of the items, tools and test equipment needed to install and adjust the REVOLUTION XR/d Table. If the exact tool listed below is not available, use the nearest equivalent.

TABLE 3–8
TOOLS AND TEST EQUIPMENT

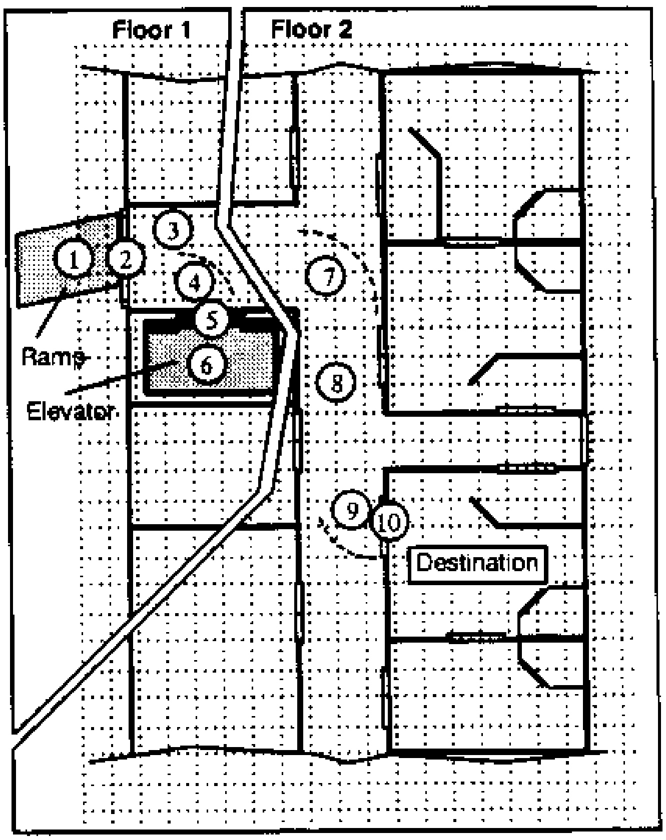
DESCRIPTION	USED FOR	SOURCE	RECEIVED (Date)
Electric hammer drill with bits	Pre–Installation	GE Service Engineer	__ / __ / __
Digital multimeter	Calibration and Functional Checks	GE Service Engineer	__ / __ / __
4 Ft. Level. (or two standard levels)	Installation	GE Service Engineer	__ / __ / __

3-7 Route Survey

3-7-1 Step One – Sketch

Begin preparing Route Survey by sketching the area of the hospital or clinic which will receive the equipment. Include all areas on the delivery route from outside of building to destination. See sample sketch below.

Reference Numbers Numbers in circles refer to Route Survey data. The Route Survey is a form on which site data is listed (step2).



3-7-2 Step Two – Survey

Data concerning the intended delivery route is recorded on the Route Survey on the following pages. Record all loading capacities, corridor widths, door openings, turning radii, flooring materials, elevator sizes, obstructions and so on.

3-7-3 Step Three – Check

Verify equipment can be transported via the route specified in step 1. Compare Route Survey compiled in step 2 to equipment specifications in this and other applicable pre–installation directions.

ROUTE SURVEY

Ref. No.	**Area:** *loading dock, doorway, hallway,* **turn, elevator, obstruction, etc.**	**Limitation:** *loading capacity, height, with, depth* flooring material, radius, etc.

3-8 Pre–installation Checklist

Equipment Delivery Date _______________ Salesman ______________________________

Customer ____________________________ FDO # ________ Room # _______________

Equipment ____

RESPONSIBILITY

		GE	PURCH.	OTHER	COMPLETE
PHYSICAL REQUIREMENTS OF SITE					
1.	Is room size adequate for intended equipment configuration?	____	____	______	_______
2.	Is floor strong enough for intended equipment and mounting methods– have seismic codes been considered?	____	____	______	_______
3.	Does delivery route accommodate all intended equipment?	____	____	______	_______
4.	Has radiation physicist been consulted?	____	____	______	_______
5.	Have necessary alterations been made to circumvent obstructions?	____	____	______	_______
6.	Are modifications to room construction finished?	____	____	______	_______
7.	Have supports, platforms, suspensions, ceiling materials been provided?	____	____	______	_______
8.	Are support structures installed for floor, ceiling, and wall mounted equipment?	____	____	______	_______
9.	Has floor been modified for cable ducts?	____	____	______	_______
10.	If drop–in ceiling is not used, is access panel provided (3x2 ft. minimum)?	____	____	______	_______
11.	Is electrical service in place– at the ratings specified in pre–installation documentation?	____	____	______	_______
12.	Is power available to operate power tools?	____	____	______	_______
13.	Are non–electrical lines (air, water, oxygen, vacuum) installed?	____	____	______	_______

RESPONSIBILITY

		GE	PURCH.	OTHER	COMPLETE
INTERCONNECTION					
1.	Have signal cable, power and grounding plans been produced?	____	____	______	_______
2.	Has the necessary interconnection hardware such as junction boxes, conduit or raceways, and fittings been provided?	____	____	______	_______
3.	Has the interconnection hardware been installed?	____	____	______	_______
4.	Is flexible, stranded wire provided for Revolution XR/d power connection?	____	____	______	_______
5.	Are Revolution XR/d feeder power cables pulled, with appropriate, lengths available at disconnect box?	____	____	______	_______
6.	Are interconnecting cables continuity checked, and labelled?	____	____	______	_______
7.	Are HV cable lengths verified (25' standard)?	____	____	______	_______
8.	Is interface information available for equipment?	____	____	______	_______
GENERAL					
1.	Are ceiling, walls, and floor clear of all obstructions?	____	____	______	_______
2.	Are walls finished?	____	____	______	_______
3.	Is finish floor installed?	____	____	______	_______
4.	Are room lights installed?	____	____	______	_______
5.	Has dust–creating work been complete?	____	____	______	_______
6.	Is old equipment in room removed?	____	____	______	_______
7.	Are component positions clearly marked on floor?	____	____	______	_______
8.	Is space available to store equipment?	____	____	______	_______
9.	Is lock in door, of locked room available?	____	____	______	_______

Comments:

Inspection Dates: .

Approvals:

Sales: **Date:**

Service: **Date:**

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SECTION 4
SYSTEM RATINGS AND SPECIFICATIONS

This section identifies the range, ratings, and accuracy during the operation of the Revolution XR/d system, unless limited by specific X–ray tube ratings.

4-1 Available kVp Range for the SCPU Power Units

The full kVp range for the SCPU Power Units is listed in Table 4–1. The selectable increments within each range are as follows: Radiographic selections are from 40 kVp through 150 kVp in 1 kVp increments.

TABLE 4–1
RANGE OF PEAK X–RAY TUBE POTENTIAL (KVP) FOR SCPU, MP 60/80/100, AND MP PHASE 4 POWER UNITS

MODE	SELECTABLE VALUES IN KVP																							
	35	40	45	50	55	60	65	70	75	80	85	90	95	100	105	110	115	120	125	130	135	140	145	150
RADIO–GRAPHIC																								

4-2 Fixed Radiographic Exposure Times

The full range and the selectable increments of exposure time for Fixed Time Radiographic, including Concentrated Focal Spot operation, are as follows:

1.00 msec	10.0 msec	100.0 msec	1.00 sec
1.25 msec	12.5 msec	125.0 msec	1.25 sec
1.60 msec	16.0 msec	160.0 msec	1.60 sec
2.00 msec	20.0 msec	200.0 msec	2.00 sec
2.50 msec	25.0 msec	250.0 msec	
3.20 msec	32.0 msec	320.0 msec	
4.00 msec	40.0 msec	400.0 msec	
5.00 msec	50.0 msec	500.0 msec	
6.40 msec	64.0 msec	0.640 sec	
8.00 msec	80.0 msec	0.800 sec	

4-3 AEC Radiographic Exposure Times

The range of exposure time for Photo–timed (AEC) Radiographic, including Concentrated Focal Spot operation, is from 1.00 millisecond through 2.00 seconds. The 2.00 second maximum time (Back up Time) is automatically imposed.

Tolerance is +/– 1% plus tolerance of measuring device.

Fixed Time and AEC Radiographic Exposure Times

There are two additional time factors which apply to exposure time for both the Fixed Time Radiographic and AEC Radiographic modes, including Concentrated Focal Spot operation: Termination time is 1.0 millisecond maximum at tube current greater than 200 mA.

4-4 X–ray Tube Current (mA)

The full range of X–ray tube current (mA) for Radiographic modes is listed in Table 4–2.

The selectable increments for Radiographic modes are as follows:

10.0 mA	40.0 mA	160.0 mA	500.0 mA
12.5 mA	50.0 mA	200.0 mA	640.0 mA
16.0 mA	64.0 mA	250.0 mA	800.0 mA
20.0 mA	80.0 mA	320.0 mA	1000.0 mA
25.0 mA	100.0 mA	400.0 mA	
32.0 mA	125.0 mA		

TABLE 4–2
RANGE OF X–RAY TUBE CURRENT FOR RADIOGRAPHIC MODES

MODE	SELECTABLE VALUES IN mA																				
	10	12.5	16	20	25	32	40	50	64	80	100	125	160	200	250	320	400	500	640	800	1000	1250
RADIOGRAPHIC (all generators)	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■		1		

1 Selectable subject to power unit rating.

TABLE 4–3
SCPU RADIOGRAPHIC MA RATINGS

KVP SELECTED UP TO:	SCPU 65 MAX MA	SCPU 80 MAX MA
80	800	1000
100	640	800
125	500	640
150	400	500

Milliampere Seconds (mAs) MAs selections for fixed time radiographic modes, including concentrated focal spots, consist of the following:

–	1.0	10.0	100.0
–	1.25	12.5	125.0
–	1.6	16.0	160.0
–	2.0	20.0	200.0
0.25[1]	2.5	25.0	250.0
0.32[1]	3.2	32.0	320.0
0.40[1]	4.0	40.0	400.0
0.50[1]	5.0	50.0	500.0
0.64	6.4	64.0	640.0
0.8	8.0	80.0	

Exception 1:

Smallest mAs selections (below 0.64 mAs) are available only for 200 mA and above.

Exception 2:

SCPU Systems: Maximum mAs selection is 640.0 mAs.

For Automatic Exposure Control (AEC) mode, mAs is not selectable. Backup mAs is limited to a maximum of 512 mAs.

For **SCPU** – Exceptions of compliance with IEC 601–2–7

The reference current–time products used in determining compliance with IEC 601–2–7 are as follows:

70 kVp – 640 mA, 0.1 seconds

100 kVp – 500 mA, 0.1 seconds

150 kVp – 320 mA, 0.1 seconds

The range of compliance for SCPU is between 0.25 mAs and 640 mAs with the following exceptions:

At 250 mA: Tube voltage equal to 70 kVp and times less than 2 milliseconds.

4-5 Generator Ratings

TABLE 4–4
RADIOGRAPHIC MAXIMUM EXPOSURE TIME & DUTY CYCLES FOR SCPU

mA[1]	MAXIMUM EXPOSURE ON TIME, SECONDS	REQUIRED TIME OFF, SECONDS	PERCENT DUTY	MAXIMUM DURATION OF SEQUENCE, HOURS*
1000	0.64	21.0	3.0	0.2
800	0.80	21.0	3.8	0.2
640	1.00	26.0	3.8	0.2
500	1.25	30.0	4.0	0.2
400	1.60	30.0	5.0	0.2
320	2.00	30.0	6.3	0.2
250	2.00	29.0	8.0	0.2
200	2.00	29.0	10.0	0.2
160	2.00	28.0	12.5	0.2
125	2.00	26.0	16.0	0.2
80–100	2.00	26.0	20.0	0.2
32–64	2.00	22.0	31.0	0.2
10–25	2.00	2.5	80.0	0.2

*Allow 1/2 hour rest between sequences.
[1]The kV of these mA stations is limited by the kW rating of the Power Unit.

In order to provide full rated output, the X–ray generator must be supplied with power from a source with very low impedance. The maximum values of source impedance allowed are given below in Table 4–5.

TABLE 4–5
MAXIMUM SOURCE IMPEDANCE AND REGULATION

For a three phase line with a nominal line voltage of 480VAC (see (1)).

GENERATOR DESIGNATION	MAX. kVa DEMAND	LINE CURRENT @NOM. VOLTS	MAX % REG. ALLOWED	MAX EQUIV. (2) SOURCE (LINE) IMPEDANCE (3) IN OHMS
SCPU 65	98	118.5	N.A.	0.24
SCPU 80	118	143.0	N.A.	0.16

1. Other "nominal" voltages are permitted (see service manual); however, the source impedance must be recalculated according to the formula in (2) for other voltages.

2. Specified impedance is the total effective loop source impedance as seen at the generator's power unit input terminals. Values given are based on the nominal voltage listed. If other input voltage is used (within range specified in appropriate service manual), adjust impedance value as follows:

$$Z_{new} = Z_{listed} \times \left(\frac{V_{new}}{V_{listed}} \right)^2$$

3. Specified values are for full rated output. 6.8 percent regulation can be tolerated at reduced ratings. See individual service manuals for details.

4-6 PDU Connector Ratings

The connectors on the PDU have the following maximum current ratings:

J1 –	0.5 A	
Service Outlet –	1.5A	
J3 –	7A	DSA1
J4 –	7A	DSA2
J5 –	0.5A	
J6 –	1A	OTS
J7 –	0.5A	Wall Stand
J8 –	0.5A	spare
J9 –	6A	Power strip

4-7 Accuracies

4-7-1 *Description of Accuracies*

These accuracies are stated in terms of maximum theoretical deviations from the labeled control settings for all technic factor combinations in order to comply with the requirements of the US Safety regulation 21 CFR 1020.30.

For radiation output, the coefficient of variation is less than 0.05 for successive exposures having constant technic factors.

Note: Accuracies stated within this document pertain to General Electric Company parts and equipment only.

4-7-2 *General Conditions*

Accuracies stated in this manual are subject to the following conditions:

1. Input power requirements are met.
2. Unit installed and adjusted per service manual.
3. Periodic maintenance, as specified, is followed by owner.
4. Warm-up of the selected x-ray tube performed.
   - > Warm–up requirement applies only if tube has not been used for several hours. Refer to Warm-Up Procedures in Tube Rating Directions.
   - > If tube warm-up requirement is not observed, add an additional +10% to the stated mA accuracy for the initial 15 minutes of use.

Peak Tube Potential (kVp) Accuracy Measurement Base

Generated high voltages at anode and cathode are reduced by a precision voltage divider, such as Catalog C1515A for LFX only. MP 60/80/100 and MP Phase 4 calibration can also be accomplished with the non–invasive Keithley 35080A divider. Resulting peak values can be observed on a calibrated dual channel oscilloscope (Tektronix 468 or equivalent) using algebraic addition. Or, kVp may be measured using the internal metering system.

Note: To achieve technical accuracy and reproducibility in fixed time spot film exposures, it is recommended that the prep switch be engaged for approximately three seconds before actuating the expose switch.

Failure to follow this procedure could result in poor image quality or possible additional exposures.

Table 4–6 stated accuracies apply for synchronous contacting with SCPU.

TABLE 4–6
PEAK TUBE POTENTIAL (KVP) ACCURACIES FOR SCPU

MODE	CONDITIONS	SCPU ACCURACY**
RADIOGRAPHIC	40–150 kVp After initial 10 msec of exposure	+/– 3% +/– 2kVp
	During initial 10 msec of exposure	+/– 3% +/– 2 kVp

**Calibration and measurements are subject to an additional ±6% accuracy due to the instrumentation, when C1515A or Keithley divider is used. For installations outside North America, in those cases where a Dynalyzer III with display unit is used, calibration and measurement instrument accuracy is 2ΔM1. See Section 2–4, Accuracy Formulas, for an explanation of ΔM1.

Note: Initial time interval is defined per Table 4–7.

TABLE 4–7
INITIAL TIME INTERVAL

CINE TUBE TYPE	CABLE LENGTH 80′ HV CABLE	CABLE LENGTH 90–100′ HV CABLE
CONVENTIONAL TUBES	1.5 MSEC	1.8 MSEC

X–ray Tube Current (mA) Accuracies Measurement Base

X–ray tube current (mA) is indicated indirectly. The measurement of indicated X–ray tube current is defined as the integral of actual X–ray tube current over the period during which actual kV exceeds 75% of the peak kV divided by the length of the integration period in seconds. Integration of actual X–ray tube current may be accomplished with an external instrument connected in series with the X–ray tube or with the internal metering system. The time measurement is based upon the time base of the measuring instrument, or the internal metering system may be used. For the purpose of making X–ray tube current measurements, exposures are initiated at least 3 seconds after system prepare (rotor start).

TABLE 4–8
X–RAY TUBE CURRENT (MA) ACCURACIES FOR SCPU POWER UNIT

MODE	CONDITIONS	SCPU ACCURACY*
RADIOGRAPHIC	50 kVp and below.	+(5% + 2 mA) –(25% + 2 mA)
	Above 50kVp up to 150 kVp and exposure times less than 40.0 milliseconds.	+/–(10% + 2 mA)
	Above 50kVp up to 150 kVp and exposure times greater than or equal to 40.0 milliseconds.	+/–(5% + 2 mA)

* Accuracy measurements must account for tolerance of the instrumentation being used. For example, when a Dynalyzer III with display unit is used, calibration and measurement instrument accuracy is 2ΔM2. See Section 5–7, Accuracy Formulas, for an explanation of ΔM2.

Exposure Time Accuracy Measurement Base

In the recording modes, the time intervals .001 to 10.0 seconds are measured as time during which kilovoltage is at and above 75% peak value. Kilovoltage is measured as described above. Time is measured with the time base of the oscilloscope, or the internal metering system can be used.

TABLE 4–9
EXPOSURE TIME ACCURACIES FOR SCPU

MODES	CONDITIONS	SCPU ACCURACY**
RADIOGRAPHIC	Exposure times of 1.0 to 12.5 milliseconds (except as notes below).	+/– 5% +/– 0.5 msec
	Exposure times of 16 to 80 milliseconds (except as noted below)	+/– 5% +/– 0.5 msec
	Exposure times of 100 milliseconds to 2 seconds (except as noted below)	+/– 5% +/– 0.5 msec
	121 to 150 kVp and 10 to 25 mA	+/– 5% +/– 0.5 msec
	121 to 150 kVp and 32 to 100 mA	+/– 5% +/– 0.5 msec
*		

* Minimum exposure time is limited to 0.64 mAs at selected mA.

** Radiographic exposure time calibration and measurements are subject to an additional +/–4% accuracy due to the instrumentation used. For installations outside the North America, in those cases where a Dynalyzer III with display unit is used calibration and measurement instrument accuracy is 2ΔM3. See Section 4–8, Accuracy Formulas, for an explanation of ΔM3.

4-8 Dynalyzer III Accuracy Formulas

$\Delta M1 = (1.5\% + 0.75\ kV)$

$\Delta M2$ (radiographic) $= \Delta M4$ (radiographic) $+ \Delta M3 + 2\%$

$\Delta M3 = 100 \times \{ 0.25 \quad (0.005 \times t) \quad [5.5 \times ((0.02 \times kVp \times 0.75)+0.4)/mA] \quad 0.066\}/t$ percent

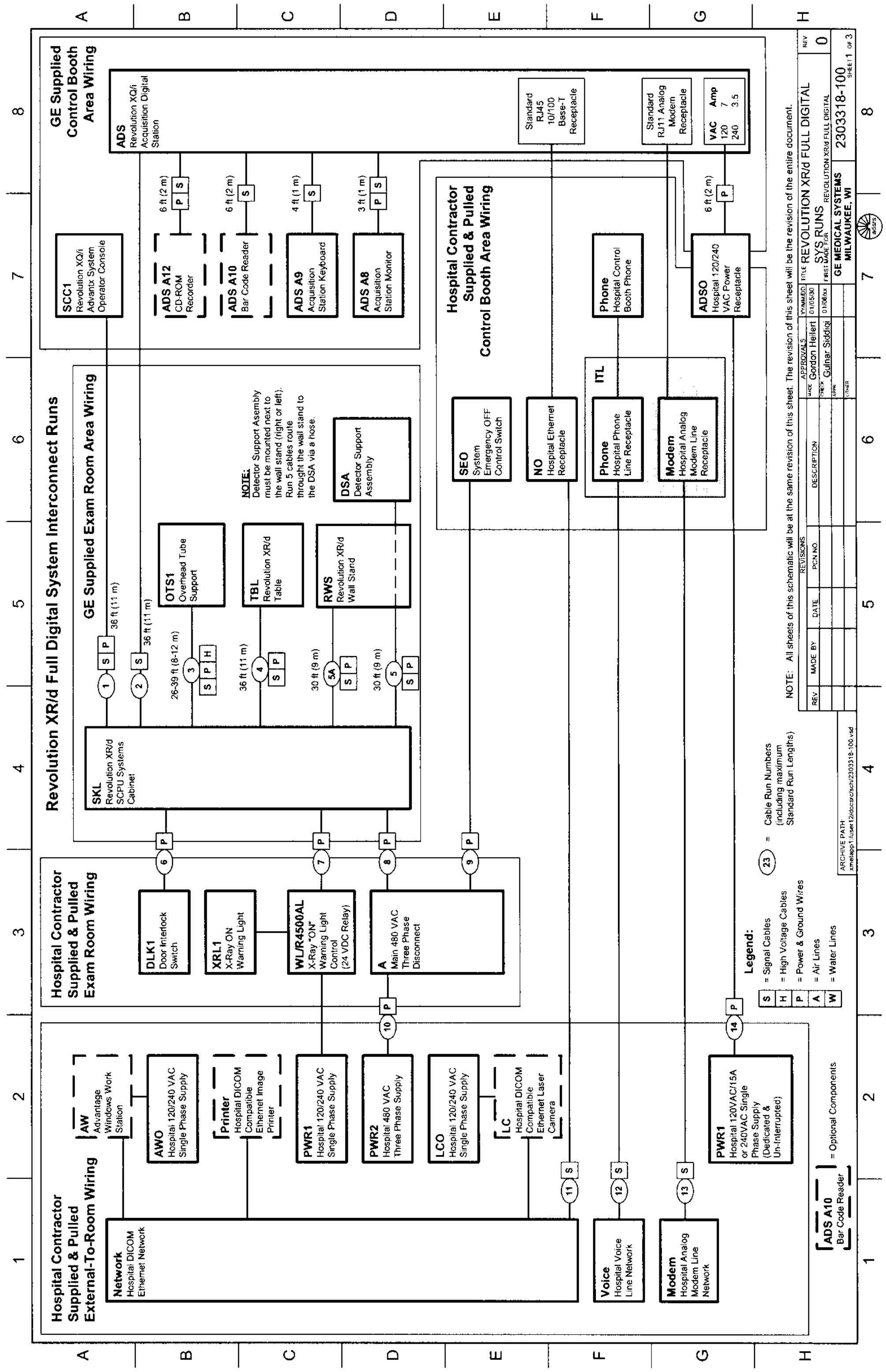
$\Delta M4$ (radiographic) $= 100 \times \{ 0.1 \quad (0.026 \times mAs) \quad (t/1000.)\}/mAs$ percent

,where t is the exposure time in millisecond

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APPENDIX A – INTERCONNECT INFORMATION

Detailed Cable Run Map



Detailed Cable Information Chart

GE Supplied Cable List

Run #	MIS #	Net Useable Length w/ Standard Length Cables (Part of Every Order): Feet	Meter	Cable Part #	Net Useable Length with Long Length Cables (Additional Cost on Order): Catalog #	Feet	Meter	Cable Part #	Cable Information: Cable Description	UL Style	Cable Class	Volt Rate	Act Volt	Temp Rate (C)	Diameter: Inch	mm
1	11594A	36	11	2216136-2	S1000LA	56	17	2230608-2	System Console Cable	2464	3	300	120	80°	0.67	17
2	11572A	36	11	2216136		56	17	2230608	Fiber Optic	OFNP	N/A	N/A	0	70°	0.12	3
3	11612A	36	11	2272863-5	B2055WD	46	14	2272863-22	Stator Cable	2516	2	600	600	105°	0.48	12
	11613A	33	10	2272863		46	14	2272863-18	HV Cable	GE 120	GHVC	75kV	75kV	90°	0.67	17
	11614A	33	10	2272863-2		46	14	2272863-19	HV Cable	GE 120	GHVC	75kV	75kV	90°	0.67	17
	11615A	26	8	2272863-3		43	13	2272863-20	AC Pwr Cord	E3462	SJT	300	120	90°	0.35	9
	11616A	26	8	2272863-6		43	13	2272863-23	Ground Wire	1028		600	0	105°	0.24	6
	11629A	26	8	2268602-7		43	13	2268602-8	9 Conductor CANopen	2464	2	300	9 VDC	80°	0.31	8
	11630A	26	8	2268602-9		43	13	2268602-10	9 Conductor UIF /collimator CAN	2464	2	300	9 VDC	80°	0.31	8
4	11617A	36	11	2272863-12	S1100KB	56	17	2272863-29	9 Conductor	2464	2	300	24 VDC	80°	0.31	8
	11618A			2272863-8		56	17	2272863-25	27 Conductor	2464	2	150	24 VDC	80°	0.39	10
	11619A			2272863-10		56	17	2272863-27	AC Pwr Cord	E3462	SJT	300	120	90°	0.35	9
	11620A			2272863-9		56	17	2272863-26	Fiber Optic	OFNP	N/A	N/A	0	70°	0.12	3
	11621A			2272863-13		56	17	2272863-30	9 Conductor Ion Chamber	2464	2	300	24 VDC	80°	0.35	9
	11622A			2272863-15		53	16	2272863-32	Ground Wire	1028		600	0	105°	0.24	6
	11631A			2272863-21		53	16	2272863-28	AC Pwr Cord	2464	SJT	300	220	90°	0.36	9.3
	11632A			2268602-11		53	16	2268602-12	9 Conductor CANopen	2464	2	300	9 VDC	80°	0.31	8
	11633A			2268602-13		53	16	2268602-14	9 Conductor CANopen	2464	2	300	9 VDC	80°	0.31	8
5	11638A	30	9	2272863-37	S1100KC	46	14	2272863-44	9 Conductor	E3462	SJT	300	120	90°	0.35	9
	11639A	30	9	2272863-38		46	14	2272863-45	27 Conductor	1028		600	0	105°	0.24	6
	11643A	30	9	2272863-42		46	14	2272863-49	AC Pwr Cord	E3462	SJT	300	120	90°	0.35	9
5A	11637A	30	9	2272863-36		46	14	2272863-43	Fiber Optic	1028		600	0	105°	0.24	6
	11640A	30	9	2272863-39		46	14	2272863-46	9 Conductor Ion Chamber	E3462	SJT	300	120	90°	0.35	9
	11641A	30	9	2272863-40		46	14	2272863-47	Ground Wire	1028		600	0	105°	0.24	6
	11642A	30	9	2272863-41		46	14	2272863-48	AC Pwr Cord	E3462	SJT	300	120	90°	0.35	9
	11644A	30	9	2268202-19		46	14	2268202-20	9 Conductor CANopen	1028		600	0	105°	0.24	6

MIS #	One End Information: Desig	Used in Cab: Ft	M	Plug Type	Plug Size: Diam Inch	Diam mm	Width Inch	Width mm	Length Inch	Length mm	Depth Inch	Depth mm	Other End Information: Desig	Used in Cab: Ft	M	Plug Type	Plug Size: Diam Inch	Diam mm	Width Inch	Width mm	Length Inch	Length mm	Depth Inch	Depth mm
11594A	SKL	10	3	15 Pin Sub-D Female			0.63	16	1.73	44	1.97	50	SCC1	4	1	Mixed Block Female			1.06	27	2.83	72	3.39	86
				15 Pin Sub-D Male			0.63	16	1.57	40	2.05	52												
				3 P Mate/ Lock			0.55	14	1.18	30	1.10	28												
				Fiber Optic DP	0.31	8																		
				Ground Terminal																				
11572A	SKL	10	3	Duplex Fiber			0.39	10	0.91	23	2.05	52	ADS	4	1	Duplex Fiber			0.39	10	0.91	23	2.05	52
11612A	SKL	10	3	12 Pin Mate/Lock			0.91	23	1.18	30	1.38	35	OTS1	23	7	push on, ring terminals								
11613A	SKL	10	3	HV Connector	2.44	62					8.27	210	OT1S	23	7	HV Connector	2.44	62					8.27	210
11614A	SKL	10	3	HV Connector	2.44	62					8.27	210	OTS1	23	7	HV Connector	2.44	62					8.27	210
11615A	SKL	10	3	Twist Lock 15A	1.38	35					2.76	70	OTS1	13	4	3 Pin Mate/ Lock			0.6	15	1.2	30	1.12	28
11616A	SKL	10	3	Bare Lead	0.24	6							OTS1	13	4	Bare Lead	0.24	6						
11629A	SKL	10	3	9 Pin Sub-D Male			0.59	15	1.38	35	2.20	56	OTS1	13	4	9 Pin Sub-D Female			0.63	16	1.34	34	2.20	56
11630A	SKL	10	3	9 Pin Sub-D Female			0.63	16	1.34	34	2.20	56	OTS1	13	4	9 Pin Sub-D Male			0.59	15	1.38	35	2.20	56
11617A	SKL	10	3	9 Pin Sub-D Male			0.59	15	1.38	35	2.20	56	TBL	3	1	9 Pin Sub-D Male			0.59	15	1.38	35	2.20	56
11618A	SKL	10	3	25 Pin Sub-D Male			0.59	15	1.57	40	2.09	53	TBL	3	1	25 Pin Sub-D Female			0.59	15	1.57	40	2.68	68
11619A	SKL	10	3	Twist Lock 15A	1.38	35					2.76	70	TBL	3	1	IEC320 C13 10A			0.75	19	1.06	27	2.17	55
11620A	SKL	10	3	Duplex Fiber			0.39	10	0.91	23	2.05	52	TBL	3	1	Duplex Fiber			0.39	10	0.91	23	2.05	52
11621A	SKL	10	3	9 Pin Sub-D Female			0.63	16	1.34	34	2.20	56	TBL	3	1	9 Pin Sub-D Female			0.63	16	1.34	34	2.20	56
11622A	SKL	10	3	Bare Lead	0.24	6							TBL	3	1	Ring Terminal								
11631A	SKL	10	3	12 Pin Mate/Lock			0.91	23	1.18	30	1.38	35	TBL	3	1	12 Pin Mate/ Lock			0.91	23	1.18	30	1.38	35
11632A	SKL	10	3	9 Pin Sub-D Male			0.59	15	1.38	35	2.20	56	TBL	3	1	9 Pin Sub-D Female			0.63	16	1.34	34	2.20	56
11633A	SKL	10	3	9 Pin Sub-D Male			0.59	15	1.38	35	2.20	56	TBL	3	1	9 Pin Sub-D Female			0.63	16	1.34	34	2.20	56
11638A	SKL	10	3	9 Pin Male			0.59	15	1.3	35	2.2	56	DSA	6	2	9 Pin Male			0.59	15	1.3	35	2.2	56
11639A	SKL	10	3	25 Pin Female			0.59	15	1.65	42	2.68	68	DSA	6	2	25 Pin Female			0.59	15	1.65	42	2.68	68
11643A	SKL	10	3	Twist Lock 15A	1.38	35					2.76	70	DSA	6	2	IEC 320			0.75	19	1.06	27	2.17	55
11637A	SKL	10	3	SC Duplex			0.59	10	0.91	23	2.05	52	WLS	2	1	SC Duplex			0.39	10	0.91	23	2.05	52
11640A	SKL	10	3	9 Pin Female			0.59	15	1.3	35	2.2	56	WLS	2	1	9 Pin Female			0.59	15	1.3	35	2.2	56
11641A	SKL	10	3	Bare Lead	0.24	6							WLS	2	1	Bare Lead	0.24	6						
11642A	SKL	10	3	Twist Lock 15A	1.38	35					2.76	70	WLS	2	1	IEC 320			0.75	19	1.06	27	2.17	55
11644A	SKL	10	3	9 Pin Male			0.59	15	1.3	35	22	56	WLS	2	1	9 Pin Female			0.59	15	1.3	35	2.2	56

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All sheets of this schematic will be at the revision of this sheet.

REVISIONS					APPROVALS		YY/MM/DD
REV	MADE BY	DATE	PCN NO.	DESCRIPTION	MADE	Gordon Heilert	01/05/30
					CHECK	Gulnar Siddiqi	01/06 /XX
					APPR		
					OTHER		

TITLE REVOLUTION XR/d FULL DIGITAL SYS RUNS
REV 0
FIRST MADE FOR: REVOLUTION XR/d FULL DIGITAL
GE MEDICAL SYSTEMS
MILWAUKEE, WI
2303318–100 SHEET 2 OF 3

Hospital Electrical Contractor Supplied Wiring

Run #	Quantity	Min. Wire Size AWG	Min. Wire Size mm²	Description	Cable Take-Up inside GE Cabinet Feet	Cable Take-Up inside GE Cabinet Meters	Notes
6	3 Wires	14	2	Exam Room Door Interlock Switch to SKL Systems Cabinet	10	3	2 conductor cable with foil shield and drain wire.
7	3 Wires	14	2	X-Ray Warning Light 24 VDC Control to SKL Systems Cabinet	10	3	2 conductors to N.O. contacts rated for 240VAC @ 15A max. GE offers R4500AL Kit to provide 24 VDC control of 120/240 VAC Warining Light indicator.
8	3 Power Wires	See Notes		Room 480 VAC Disconnect to SKL Systems Cabinet	10	3	See Feeder Tables for recommended wires sizes.
	1 Ground Wire	1/0	50				
9	3 Wires	14	2	Room 480 VAC Disconnect to System Emergency OFF (SEO)	Not Applicable		Black, White, and Green wires.
10	3 Power Wires	See Notes		Room 480 VAC Disconnect to Hospital Power Source			See Feeder Tables for recommended wires sizes.
	1 Ground Wire	1/0	50				
	1 Neutral Wire	See Notes					
11	1 Ethernet Wire	See Notes		Hospital Ethernet Network to Aquisition Digital Station	2	1	ADS equipped with Standard RJ45 10/100 Base-T Receptacle. Category 5 Cable required.
12	1 Telephone Wire	See Notes		Hospital Telephone Voice Network to Control Booth Telephone			Standard RJ11 Telephone Receptacle & Telephone. This line may be routed through a telephone switchboard.
13	1 Telephone Wire	See Notes		Hospital Telephone Analog Modem Network to Aquisition Digital Station			ADS equipped with Standard RJ11 Analog Telephone Receptacle. Line must be a direct number from outside the facility. Do not route this line through a telephone switchboard. Telephone line operating charges are paid by Hospital.
14	1 Power Wire	14	2	Control Booth 120 VAC / 15 A Receptacle to Hospital Single Phase 120 VAC Power Source, or... Control Booth 240 VAC / 10 A Receptacle to Hospital Single Phase 240 VAC Power Source.			Power Supply source must be un-interrupted.
	1 Ground Wire	14	2				
	1 Neutral Wire	14	2				

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OTHER		

TITLE REVOLUTION XR/d FULL DIGITAL
SYS RUNS
FIRST MADE FOR: REVOLUTION XR/d FULL DIGITAL
REV 0
GE MEDICAL SYSTEMS
MILWAUKEE, WI
2303318-100
SHEET 3 OF 3

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